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A GUIDE TO REGIONAL MULTIPLIER ESTIMATION

A GUIDE TO REGIONAL MULTIPLIER ESTIMATION

Prepared for the Project Assessment
and Evaluation Branch
Department of Regional Economic Expansion

by

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PREFACE

The indirect effects which occur as a result of major projects are of considerable interest to economic analysts, politicians, and other observers of the economic scene. Too frequently, however, one encounters estimates of these indirect effects that are based on little other than conjecture, and yet, frequently these estimates wield substantial influence in public investment decisions. The chief value of this study by Dr. Harvey Schwartz of York University is that it provides a consistent and precise means for analysts to derive reasonably accurate estimates of the indirect effects of investment projects.

The estimates of indirect economic effects contribute information that is essential to the project assessment methodology practised by the Project Assessment and Evaluation Branch of the Department of Regional Economic Expansion. This methodology is the subject of the report, A Manual for the Analysis and Appraisal of Industrial Projects in Canada, *which will be published by the Project Assessment and Evaluation Branch in the near future, and which may be viewed as a companion to the present study.*

Any views or opinions expressed in this study are those of Dr. Schwartz and do not necessarily reflect those of the Department of Regional Economic Expansion or the Government of Canada.

Colin J. HINDLE
Director General
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Hull, April 1982

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CHAPTER ONE

INTRODUCTION

1.1 THE REGIONAL MULTIPLIER IN POLICY ANALYSIS AND PROJECT APPRAISAL

The persistence of regional disparities and the concern with regional development in general has led to an increased interest in the regional multiplier as a tool for policy analysis. Regional multipliers are commonly used to estimate the effect of some policy-related change in regional expenditure on regional income or employment. The expenditure change may be part of a fiscal policy deliberately aimed at alleviating short-run regional distress or it may arise out of long-run programs designed to foster regional economic growth. However, in many cases the expenditure change is made on the basis of other policy concerns where the regional income or employment effects are a secondary but still important consideration.

Public expenditure proposals, especially for developmental purposes, are normally subject to a project appraisal or benefit-cost analysis. This tends to be true for both pure public sector projects and joint public-private sector ones where the public sector participation takes the form of assistance grants or spending on project-related infrastructure. The regional multiplier can enter into an appraisal of a project in two very different ways. First, while a project appraisal usually concentrates on a project's effects on national welfare, the question of its impact on a region's income or employment is invariably raised. Since this question is of concern to both policy makers and regional residents, a regional impact analysis is often required. Second, the regional multiplier can enter directly into the appraisal of a project to help estimate the national welfare change (if any) from the incremental secondary activity induced by a project.

1.2 THE ROLE OF THE GUIDE IN PROJECT APPRAISAL

While the importance of the regional multiplier for project appraisal is normally recognized, this is not reflected in the method by which multiplier estimates are usually obtained. The problem is caused by the difficulties in making estimates for the small, subprovincial regions typically employed in project appraisal. A lack of readily available data as well as the time constraints faced by the analyst mean that the estimates cannot be made with models used at the national or provincial level, such as the Keynesian and the input-output models. In many cases, the analyst is forced to fall back on rules-of-thumb or to employ estimates drawn from national or provincial studies. Often, this is done without taking into account the relevance of the estimates for the particular region or project under appraisal. In some cases an alternative model, the economic base model, is used but it is normally estimated, interpreted, and applied in an unsatisfactory manner. As a result, the multiplier estimates tend to be unrea-

sonably large and they are interpreted and applied in a manner inconsistent with the methodology used to appraise the project. The seriousness of the problem is most apparent in marginal projects where the expected (and usually unrealized) regional secondary effects often become the prime justification for undertaking a project.

This volume is intended to help the analyst overcome the difficulties of obtaining multipliers for small, subprovincial regions. It is also intended to help the analyst evaluate the type of multiplier estimates provided in project proposals for such regions. This will be done by providing a guide to the mechanics of estimation and application within the framework of the only type of multiplier model normally operational at this level, the economic base model.

The economic base model can be estimated with data that are usually readily available at the small-region level. Moreover, it is capable of yielding reasonable results, providing that it is properly estimated, interpreted, and applied. The method of estimation used in this Guide is somewhat different from that found in most economic base studies and it has the merit of compelling the analyst to become familiar with the region under study. The model is also interpreted in a different way and applied in a manner consistent with the methodology of project appraisal. This approach produces a set of multipliers that can be tailor-made to fit both the region and the project under appraisal. And while the multipliers are designed to be used specifically for project appraisal, they are also relevant for other types of analyses that require a regional multiplier.

1.3 A BRIEF OUTLINE OF THE GUIDE'S CONTENTS

The Guide provides a step-by-step approach to the mechanics of multiplier estimation and application. Chapter Two sets out the framework of analysis used to obtain the multipliers. This is done by first defining the concept of the regional multiplier within the context of a model that is likely to be familiar to most readers, a simple Keynesian model. The economic base model is then introduced and the employment multipliers associated with it are derived and interpreted. Employment multipliers are stressed because the labour force data required to estimate such multipliers are the most easily obtained data at the small-region level.

After the model has been introduced, the nature of the employment created by a project is investigated in Chapter Three. This is done to determine the relevant project multiplicand, the magnitude to which the multipliers are applied. The problem of defining the relevant project multiplicand is an important one because the multiplicand itself comprises a large share of the total multiplier effects. It is also important because the type of multipliers used depends on the nature of the project multiplicand.

Chapter Four deals with the equally important question of how to select the region for which the multiplier effects are to be measured. After it has been selected, its economic base can be identified and measured, and Chapter Five explains how this is done. Chapter Six provides a lengthy empirical example to illustrate the problems of economic base measurement described in the previous chapter. Once the eco-

nomic base of the region has been measured, it is possible to estimate the project multipliers, and Chapter Seven explains and illustrates how this can be done. Chapter Eight carries the process one step further by describing and illustrating how the employment multipliers can be converted into income multipliers. This is of importance in regional impact analysis if the changes in income as well as employment are to be estimated. It is of even greater importance in the analysis of the national welfare change since such an analysis requires an income multiplier.

It has already been noted that the regional multiplier has a dual role in the appraisal of a project: it can be used both in an analysis of a project's impact on a particular region and in an analysis of the welfare change for the nation as a whole. Of these two uses, the first tends to be the most common. The regional multipliers required for either use are estimated in an identical manner but they are employed somewhat differently because the two analyses are concerned with very different questions. Given the most common use for the regional multiplier, the discussion in the Guide will tend to stress its application to regional impact analysis. All comments about its application to the analysis of the national welfare change are reserved for the final chapter.

CHAPTER TWO

THE FRAMEWORK OF ANALYSIS

This chapter provides the methodological framework for the multipliers to be developed in the Guide. The concept of the regional multiplier is first considered in general terms within the context of a simple Keynesian income-determination model. This discussion is intended to serve as an introduction to (or review of) the concept of the regional multiplier and to permit a comparison of this familiar framework of analysis with an alternative, the economic base model. This model can be interpreted as either a short-run or a long-run model and it can be measured in either income or employment terms. Since the employment models are much easier to estimate, they will be emphasized in the Guide. However, the income models are also important because they can be used to convert the more easily obtained employment multipliers into income multipliers. This chapter places a good deal of stress on the interpretation of the short-run and long-run models because this provides the key to the application of the models in project appraisal.

2.1 DEFINING THE REGIONAL MULTIPLIER

The regional multiplier is most usefully defined within the context of a simple Keynesian income determination model typical of the type found in introductory textbooks on economics. The model is first considered in a national setting since this is likely to be most familiar to the reader. It will then be reinterpreted to make it applicable to a region within the national economy.

In the Keynesian model, the level of national income depends on the level of aggregate demand for the economy's output. Aggregate demand consists of four generalized categories of expenditure: consumption, investment, government, and export spending. It is defined as being net of any spending on imported commodities since imports do not represent a demand for domestic output.

In this model, an equilibrium level of national income occurs when the aggregate demand for the economy's output just matches the aggregate supply. Aggregate demand includes both induced spending, which depends on the level of national income, and autonomous spending, which depends on other variables. When a change in autonomous spending occurs, the economy moves from its existing equilibrium to a new one. At the new equilibrium, the level of national income is either greater or smaller than before, but the change in national income exceeds the change in autonomous spending because of the multiplier.

Although the Keynesian model is a static model, the multiplier is most easily defined within a dynamic context. An increase in autonomous spending can be viewed as generating a flow of income to domestic factors of production that brings about, or induces, additional rounds of spending and income creation. The income

earned in each round is subject to a series of withdrawals for saving, taxes, and import spending, so that only part of the income earned in each round is re-spent on domestic output. The withdrawals from each round of income earned reduce each subsequent round of spending on domestic output until eventually extra spending and income creation fall to zero.

This process (illustrated in Figure 2-1) takes the form of a geometric progression. If ΔJ represents the initial increase in domestic spending and b, the share of each extra dollar of income spent on domestic output, then ΔY, the change in national income, would be

$$\Delta Y = \Delta J + b\,\Delta J + b^2\,\Delta J + \ldots + b^n\,\Delta J,$$
$$= \frac{\Delta J}{1 - b}.$$

The multiplier K is then

$$K = \frac{\Delta Y}{\Delta J} = \frac{1}{1 - b}.$$

The multiplier K will be greater than 1 if b is greater than zero. Since b is normally positive but less than 1, a change in autonomous spending of ΔJ will produce a change in national income of ΔY, where ΔY is some multiple of ΔJ equal to $K\,\Delta J$. The change in national income can be broken down into two parts: the part associated with the initial change in autonomous spending, or the multiplicand (ΔJ), and the part associated with the induced spending, or the secondary effects $[\Delta J\ (K-1)]$.

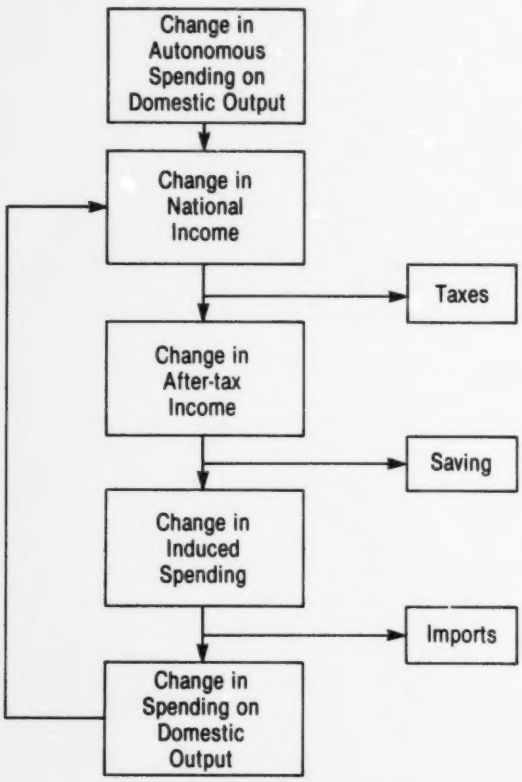
The multiplier obtained from this simple model is a static multiplier concerned with the change in national income from one equilibrium to another. It is also a final multiplier in that it measures the total effect of the change in autonomous spending (the multiplicand) and of the induced or secondary effects on national income.

The definition of the multiplier was framed in terms of an increase in autonomous spending but, of course, the multiplier works in both directions. Just as an increase in autonomous spending leads to a multiplied increase in national income, a decrease in autonomous spending leads to a multiplied decrease in national income. The point is obvious and will not be mentioned again. In the subsequent discussion, any explanation of the multiplier will normally be presented only in terms of an increase in autonomous spending to avoid unnecessary repetition. Most projects, in fact, do involve an increase rather than a decrease so that this approach is consistent with the usual concern in project appraisal.

It should also be noted that the model deals with flows of income and expenditure measured over a period of time. Hence the multiplier is concerned with the change in income as a result of a change in spending over some specified time period. For example, if the multiplier is 1.5 and there is an increase of $1 million per year in

Figure 2-1

NATIONAL INCOME DETERMINATION IN THE SIMPLE KEYNESIAN MODEL



autonomous spending, this will lead to an increase of $1.5 million per year in national income when the economy reaches its new equilibrium. The point is noted now and will simply be assumed in the subsequent discussion.

This simple income determination model is also applicable to a region within a national economy if it is reinterpreted. The reinterpretation consists of a change in terminology, where the income and expenditure concepts are applied to a region rather than a nation. The broader definitions of exports and imports embodied in this regional model are of particular importance. From a region's point of view, exports include the sale of goods and services to the rest of the nation as well as to the rest of the world. Similarly, regional imports include purchases of goods and services from the rest of the nation as well as the rest of the world. With this change in terminology, the model becomes a simple model of regional income determination and the multiplier becomes a regional multiplier.

2.2 THE ECONOMIC BASE MODEL

The concept of the regional multiplier has been introduced by means of a simple Keynesian income determination model. While the Keynesian model (albeit in more sophisticated forms) is commonly employed at the national and large-region level, the problem of obtaining data prevents it from being operational at the small-region level. This section describes an alternative that can be made operational for small regions — the economic base model.

The economic base model divides the regional economy into two broad sectors, a basic sector and a non-basic sector. The basic sector is viewed as serving markets outside the region, or export markets, while the non-basic sector serves only the internal or regional market.

The terminology employed in the model is suggestive of how changes in regional income are assumed to come about. Spending on the commodities produced by the basic sector is exogenously determined — that is, it is set by events outside the region. An increase in basic spending will increase the income of the basic sector and lead to additional spending on non-basic commodities by regional residents attached to the basic sector. This in turn will cause the income of the non-basic sector to grow. Since regional residents attached to the non-basic sector now find that their incomes have risen, they too will alter their spending on non-basic commodities. The process can be viewed as continuing, with additional rounds of non-basic spending generating more regional income and inducing more non-basic spending. However, the process will eventually come to a halt because each round of non-basic spending will be smaller than the additional income that brought it about. At this point, the regional economy will have reached a new equilibrium where the level of income in the basic sector, in the non-basic sector and in the regional economy as a whole is greater than before, and where the change in regional income is some multiple of the initial change in basic sector income.

The model has been set out in general terms but in fact it comes in two versions — a short-run and a long-run model — with the latter being the most commonly employed. The multipliers developed in the Guide depend on both models and it would be useful to set them out in formal terms. Since the short-run model most closely resembles the Keynesian model discussed previously, it will be described first. After the two models have been formally set out, the differences between them will be discussed in terms of their underlying assumptions and their usefulness in forecasting when a change in basic sector spending occurs.

2.3 THE SHORT-RUN MODEL

The short-run model is concerned with the rate of utilization of the region's productive capacity, which is usually expressed in terms of the unemployment rate of the labour force. In the short run, the regional economy has a given level of productive capacity determined by its known resource base, its capital stock, its available labour supply and its existing level of technical knowledge. If the economy is operating below full capacity, an increase in basic spending causes it to move towards

the full-capacity level. By drawing on the region's unused capital and labour resources, the increase in basic spending leads to an increase in regional output, employment, and income in the basic sector, and induces an increase in regional output, employment, and income in the non-basic sector. A decrease in basic spending has the opposite effect. Thus in the model, the level of capacity utilization in the basic sector, in the non-basic sector, and in the regional economy as a whole depends on the level of basic spending.

The model treats changes in the level of basic spending as the prime source of short-run or cyclical instability in the regional economy. This is because the region is viewed as a small economy within the national economy, heavily dependent on trade with other regions and the rest of the world. The demand for the region's exports is set by events outside its boundaries and depends on such variables as the tastes and preferences for its exports, the level of income in external markets, the prices of competitive commodities, and the tax, expenditure, and commercial policies of governments. All of these are subject to change, and when a change occurs, it affects both the region's export sales and its level of capacity utilization as represented by its unemployment rate.

Regional spending in the short-run model is capacity-utilizing rather than capacity-building. Thus any non-basic spending induced by a change in regional income cannot include capacity-building non-basic investment or government capital spending. Nor is it likely to include government current spending since this tends to depend on the size of the region, which is assumed to remain unchanged in the short run. Therefore, non-basic investment and government spending can be taken as an autonomous level of spending that is assumed to remain unchanged.

Some regional consumption spending will also be autonomous in the short run. The region's labour supply (and hence its population) are assumed to be given, and any change in regional income will accrue to existing regional residents and cause regional per capita income to rise or fall. As regional per capita income changes, regional residents will adjust their pattern of consumption spending on some commodities. But they are also likely to continue to consume the same amounts of many other commodities, and some consumption spending will remain unchanged. Non-basic spending therefore includes both autonomous non-basic spending (investment, government, and part of regional consumption) and induced non-basic spending (part of regional consumption).

The model has a very simple structure and can be set out in the following way. Let

Y = regional income,
B = basic spending, and
N = non-basic spending.

In equilibrium, regional income is the sum of basic and non-basic spending, so that

$$Y = B + N \qquad (1).$$

Basic spending is taken as exogenously determined, so that

$$B = \bar{B} \qquad (2).$$

Non-basic spending is viewed in part as autonomous and in part as a function of the level of regional income. Therefore,

$$N = a + g'Y \qquad (3),$$

where a represents the autonomous non-basic spending and $g'Y$ the induced non-basic spending, and where g' is a marginal propensity to spend on non-basic output.

If equations (2) and (3) are substituted into (1), then

$$Y = \frac{a + \bar{B}}{1 - g'} \qquad (4).$$

A change in exogenously determined basic spending, $\Delta\bar{B}$, or of autonomously determined non-basic spending, Δa, will lead to a multiplied change in regional income of $K\Delta Y$, where K, the multiplier, is

$$\frac{1}{1 - g'}.$$

If it is assumed (as is true in the model) that autonomous non-basic spending is unlikely to change in the short run, changes in basic spending become the sole determinant of the level of regional income. Set out in this way, the model is similar to the Keynesian foreign trade multiplier, where a change in export spending leads to a change in the level of regional income. The major difference is that externally determined spending is the sole determinant of the level of regional income in the short-run economic base model, whereas in the Keynesian model it is one but not the only determinant. While this difference is noted now, it will not be pursued until late in the chapter.

2.4 THE LONG-RUN MODEL

The economic base model is most commonly employed as a long-run model, where the level of regional capacity becomes dependent on external demand. A change in external demand leads to a change in the level of basic-sector capacity and this in turn induces a change in the level of non-basic-sector capacity. Therefore the growth or decline of the whole regional economy is now ultimately dependent on events determined outside of its boundaries, with the region reacting passively to a change in these events.

The model can be set out formally in the following way:

$$Y = B + N \qquad (1),$$

$$B = \bar{B} \qquad (2),$$

$$N = g\,Y \qquad (3),$$

$$\text{and } Y = \frac{\bar{B}}{1 - g} \qquad (4).$$

A change in basic spending of $\Delta\bar{B}$ will now bring about a change in regional income of $K\Delta Y$, where the multiplier K is

$$K = \frac{1}{1 - g} = \frac{Y}{B} = 1 + \frac{N}{B}.$$

The multiplier of the long-run model is then equal to 1 plus the non-basic to basic ratio (N/B) where 1 represents the multiplicand, and N/B the secondary effects. In practice, the multiplier is commonly expressed as the non-basic to basic ratio. For example, if the ratio is 2:1, non-basic income will change by two dollars for every one-dollar change in basic spending. In more conventional terms the multiplier is in fact 3, and equal to the change in basic spending of 1 plus the secondary effects of 2.

The long-run model assumes a stable and proportional relationship between the basic and non-basic sectors, expressed in terms of the non-basic to basic ratio. Hence, if a change in the size of the basic sector occurs, it induces a proportional change in the size of the non-basic sector and in the regional economy as a whole. The induced non-basic spending now includes not only induced consumption, as in the short-run model, but also induced non-basic investment, such as private business investment and residential construction, and induced government spending.

Given the assumption of proportionality between the two sectors, the propensity to spend on non-basic commodities, g, is an average propensity equal to N/Y (the ratio of non-basic spending to total regional income) and, therefore, differs from the marginal propensity g′ in the short-run model. An average propensity means that the region always spends the same share of each dollar of income on non-basic commodities. In the long run this implies that non-basic spending and capacity will grow in direct proportion to total regional income and capacity. Such a relationship would seem most appropriate if population also changes as the regional economy grows or declines.

The last statement could be supported by considering how non-basic spending might change in two alternative cases, one in which regional income doubles while the population remains unchanged and a second where both regional income and

the population double.[1] In the first case, which is similar to the short-run model, a doubling of regional income with the population unchanged will cause a doubling of per capita income. If per capita income doubles, it is unlikely that non-basic spending will also double and there are two reasons why this is so.

First, personal income taxes and personal saving will take a larger share of the new higher income than of the previous lower income. As per capita income rises, the marginal tax rate will also rise, causing the average tax rate to rise as well. Budget studies show that the average propensity to save also rises as income rises. Both of these will cause the share of income available for spending on non-basic commodities and imports out of the new higher income to be smaller than out of the previous lower income.

Secondly, the share spent on imports will tend to be larger at the new higher income. Before the income change, regional residents were consuming a package of locally produced commodities that included retail services, local manufactured goods, professional services, housing services, schools, and police and fire protection. A doubling of per capita income will not lead to a doubling of their spending on many of these commodities. Their spending response to the new higher income will rather depend on the income elasticities of demand for the commodities they consume. Many of the commodities with high income elasticities of demand will be imported or have a high import content, such as external travel, recreation, entertainment, and consumers' durables. For both reasons, therefore, non-basic spending as a share of regional income will probably be lower at the new higher income. The matter could be put in another way by simply noting that in this case, the appropriate propensity associated with the extra regional income is a marginal rather than an average propensity and that the marginal propensity is below the average.

The second case (a doubling of regional income and population) could produce a constant average propensity. The additional income would accrue to new residents of the region who would have the same per capita income as existing residents. It would seem likely that the new residents would demand a package of non-basic commodities similar to the one already being consumed by existing residents. If this is so, a doubling of income and population would also double the level of capacity of the non-basic sector. Therefore, the non-basic sector could be viewed as being replicated in proportion to the change in regional income, producing a constant average propensity to spend on non-basic commodities.

The assumption of a direct link between population size and the level of regional capacity appears not only in the model's implied consumption relationships but also in its implied production relationships. This assumption arises because a change in the level of the region's productive capacity will also affect the size of its labour force and therefore the size of its population. To demonstrate this, let us assume that an increase in external demand occurs when the regional economy is operating at capacity. If the basic sector capacity is to grow, additional labour and non-labour inputs will be required. Given the openness of the regional economy, the growth in

1 The argument set out here is similar to Tiebout, Charles M., *The Community Economic Base Study*, Committee for Economic Development, New York, December 1962, pp. 65-67.

the labour force is most likely to come about through migration, with labour moving in from other regions in response to the increased employment opportunities. If the basic sector expands, the non-basic sector will also expand, generating a demand for more labour and inducing additional migration to fill the new jobs. A decrease in external demand would be expected to have the opposite effect, with the labour force and population declining as unemployed workers seek employment opportunities elsewhere.

The relationship between the level of regional capacity and population size could be made explicit by including it in the model in the form of an additional relationship. This is in fact done by urban and regional planners who frequently use the economic base model to make population projections by linking population size to the size of the basic sector. At this stage, it is sufficient to simply recognize the link and to note that labour force changes and population changes are most likely to come about through migration. The long-run economic base model, then, is not only a model of economic and population change but also a migration model. Moreover, the long-run multiplier obtained from it is in fact a migration multiplier, a significant point if the model is to be used in forecasting.

2.5 ADDITIONAL DISCUSSION ON THE TWO MODELS

Now that the two models have been set out in formal terms, it would be useful to summarize by exploring the differences in the way changes in regional output are assumed to come about and how such differences lead to varying responses for non-basic spending. This discussion will also serve to emphasize the important differences in the way the regional labour market is assumed to operate in the two models. The section concludes with a discussion of their relevance as models of regional change and their usefulness in making forecasts when change does occur.

2.5.1 The Economic Base Model and the Regional Labour Market

The fundamental distinction between the short-run and long-run models rests on the resources, and especially the labour resources, required to bring about a change in regional output. In the short-run model, output changes are assumed to come about as a result of an increase or a decrease in the rate of employment of the region's existing labour force. In the long-run model, they are assumed to come about through a change in the size of the labour force as new residents move into the region or as existing residents move out.

Since the size of the region's labour force and hence its population are viewed as constant in the short-run model, a change in regional output, employment and income leads to a change in per capita income. In the long-run model, the size of the labour force and population change in proportion to regional output, so that a change in regional output, employment and income leaves per capita income essentially unchanged.

The difference in the way non-basic spending responds to changes in regional income in the two models is directly related to the difference in the way regional income is assumed to change in each. In the short-run model, non-basic spending is related to the region's per capita income. When it changes, regional residents become richer or poorer than before, and they alter their pattern of non-basic spending by adding to or reducing their purchases of consumption commodities. This change in non-basic spending is in response to a change in individual incomes and it induces a marginal response based on the income elasticities of demand of the commodities consumed. Such a response could be referred to as a pure income response.

A change in regional income in the long-run model causes non-basic spending to change only because there are now more or fewer regional residents than before who demand more or less non-basic output. Thus all non-basic spending and not just consumption spending will change in direct proportion to the change in population. Since the pattern of non-basic spending does not change, the response in the long-run model could be referred to as a pure population response.

As separate models, the two incorporate a rather naïve view of the operation of the regional labour market. When linked together, however, and placed within the context of a more realistic view of how the regional labour market operates, they provide a useful way of assessing the impact of a project on a region. This recognizes that a change in basic spending in the short run will lead not only to a change in the region's unemployment rate, but also to a change in its labour force participation rate, and that it may lead to some displacement of other regional activity. These short-run changes will affect the flow of labour into and out of the region, which in turn may lead to long-run changes in the size of the region's labour force.

The long-run changes depend on whether the change in basic spending is viewed as being permanent (that is, persisting over a long period of time) or temporary. The nature of the change in basic spending, then, is important in determining whether the effects will be primarily short-run or whether they will also be long-run. All of these questions have to do with the application of the two models, and this cannot really be discussed until the models have been completely set out. Any further discussion of these questions, therefore, will be deferred until the next chapter.

2.5.2 The Relevance of the Models in Explaining Regional Change

The economic base model is a simple model of short-run income determination or long-run growth that tends to be more relevant for heavily specialized than for highly diversified regions. Natural resource, mining or specialized industrial regions are very dependent on the external demand for their specialized output. Thus the level of external demand plays an important role in determining both the rate of capacity utilization and the long-run growth or decline of their regional economies. Their non-basic sectors are heavily geared to serving the needs of the export industry's workers and are relatively small since a good deal of local consumption is imported. In such regions internal demand depends primarily on the level of regional income and the non-basic sector can be viewed as a passive sector reacting to rather than initiating change in the regional economy.

In highly diversified regions, in contrast, the basic sector is less important and the non-basic sector more important. Because these regions are less dependent on external trade, a larger share of local output is consumed within them and the import content of local consumption is smaller than in heavily specialized regions. The greater importance of the non-basic sector means that it is no longer realistic to treat it as purely passive. It is now possible for variables other than the level of regional income (such as internally generated technical change) to affect the level of non-basic spending. Therefore, a change in internally determined as well as externally determined spending can lead to a change in the rate of capacity utilization and to the long-run growth or decline of the region. Since internally determined spending may also be important, the economic base model no longer provides a satisfactory explanation of regional change. However, because the level of diversity of a region tends to be directly related to its size as measured by population, it would be better to state that the economic base model, as a model to explain regional change, is more relevant to small and heavily specialized regions than it is to large and highly diversified regions such as Toronto or Montreal.

2.5.3 The Usefulness of the Models in Forecasting

The usefulness of the models in making forecasts depends critically on the stability of the two coefficients, g′ and g. If these coefficients are subject to change over the forecast period, any forecasts made with the models will be subject to error. Unfortunately there are two major reasons for believing that the coefficients may not be stable.

One reason mentioned above is that variables other than regional income can have an influence on non-basic spending. If these other variables have a significant influence and if they change during the forecast period, the values of the two coefficients will also be altered. The problem is not unique to the economic base model but arises in any model that excludes independent variables that have a significant influence on the dependent variables. In the economic base model these other variables tend to become more significant as the size and the diversity of the region grow. The problem can be minimized but not eliminated by applying the model to regions where these variables are likely to be much less significant than regional income — that is, the small, heavily specialized regions to which the model really pertains.

The second reason has to do with the postulated non-basic expenditure functions. In both models, these are linear; but they are in fact likely to be non-linear. In the short-run model the marginal tax rate and the marginal propensity to import are both likely to rise as regional income rises. This means that the value of the coefficient g′ will fall as regional income rises and will rise as regional income falls.

The value of the coefficient g in the long-run model is also likely to change as regional income changes. Again, regional income will grow as the size of the region's labour force and population grows. The growth of the region will increase the size of its domestic market and should lead to a fall in its average propensity to import. This occurs because many non-basic activities are subject to a threshold size, a minimum level of output where they become economically viable. At lower output levels,

the commodity will be imported but as the size of the region's market grows, one threshold size after another is reached and import displacement takes place. Therefore in the long-run model the value of the coefficient g will probably rise as the level of regional income rises and fall as the level of regional income falls.

The use of linear rather than non-linear expenditure functions means that the estimated values for the two coefficients apply only to the levels of regional income for which they were estimated and that they are only approximations of the coefficient values for higher or lower levels of regional income. Thus any forecasts made with the estimated coefficients will involve errors, the size of which will grow with the size of the change in regional income. The errors arise because of the simplicity of the postulated expenditure functions in the two models. They could be reduced by making the models more complex but this in turn would increase the difficulty of estimating them. Therefore if the simple models are to be used in forecasting, the forecasts will tend to be better for smaller changes in regional income than for larger ones.

2.6 BASIC AND NON-BASIC SECTOR IDENTIFICATION

The income and expenditure flows in the basic and non-basic sectors have been identified in only a general way up to this point but if the economic base model is to be completely spelled out, they must be defined more rigorously. The question is also important if the model is to be estimated.

Basic spending is autonomous spending, dependent on or motivated by events in other regions, and it is more broadly defined than the previous discussion would imply. One basic sector expenditure flow is non-resident business and household spending on the goods and services produced in the region. These are the conventional commodity exports stressed in the previous discussion and they include not only sales to other regions but also those to non-residents in the region such as tourists.

A second flow is for the exports of the services of regional factors of production. Regional capital invested elsewhere and regional labour employed outside the region (either as commuters or as temporary workers) also produce a flow of income to regional residents which can be used to support non-basic spending.

A third flow is for investment in the region motivated by external rather than internal demand. It may be undertaken by either regional residents or non-residents and will lead to a future flow of commodity exports.

Non-local (i.e., federal and provincial) government spending is also usually included as part of basic spending. In the economic base model, the region is set off from the rest of the national economy and considered as a separate unit, so that non-local government spending can be taken as an additional source of externally determined spending. However, this arises only because of the artificial way the region is treated.

If the region is viewed as part of a system of regions within the national economy, the provincial and federal governments simply become different levels of govern-

ment. Viewed in this way, spending by all three — local, provincial and federal — could be either basic or non-basic depending on the motivation to spend rather than the source of the funds. Thus some government spending will be related to the size of the region and will be induced in the long run. This would include spending used to provide the type of local services that the region either provides for itself through local government or is provided for it by non-local government, such as local education, water and sewer lines, local utilities, hospital and medical services, police and fire protection, and transportation and communication. If these services were not provided by non-local government, then the region would have to provide them for itself. Because it is part of a province and a nation, it may share in their provision by higher levels of government and in the taxes required to pay for them.

Basic government spending, in contrast, is either export-related or policy-related. It may be export-related if it is tied to the region's export activities as, for example, spending on transportation or on aid to a regional export industry. It may also constitute an export activity in itself such as provincial or federal government spending on regional goods and services for consumption by other regions. Policy-related spending includes spending designed to alleviate regional distress or to redistribute income among regions within the province or the nation.

Therefore, government spending in a long-run context can be either autonomous and part of the basic sector, or induced and part of the non-basic sector. It is also useful to distinguish between government transfer payments and resource-using current and capital spending. The latter can be either basic or non-basic depending on the motivation to spend and it involves all three levels of government. Transfer payments also can be basic or non-basic, but the distinction rests with the level of government making the payments: non-local government transfers are basic while local ones are non-basic. This distinction permits public and private transfers to be combined into the general categories of external and internal transfer payments.

Basic spending, then, consists of five flows of expenditures:

1. commodity exports (X),
2. factor exports (F),
3. basic investment (I_b),
4. basic government spending (G_b), and
5. external transfer payments (T_b).

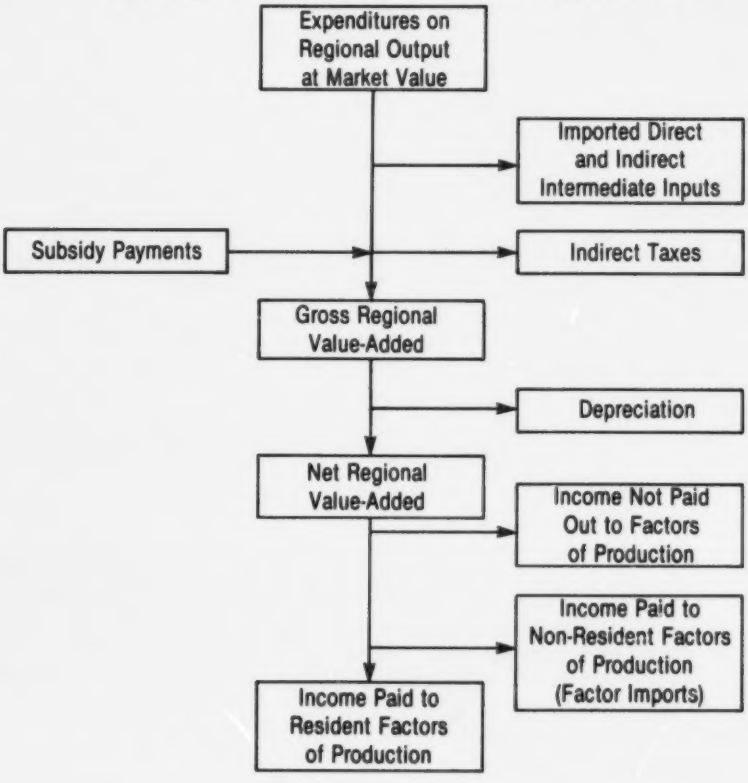
Two of these, factor exports (F) and external transfers (T_b), are pure income flows to regional residents attached to the basic sector. The other three consist of expenditures on local production which give rise to a flow of labour and capital income to regional residents in the form of wage and salary payments, proprietors' income from unincorporated business and investment income from capital invested in basic sector production. Such income constitutes only a share of the regional value-added generated from basic sector production, which in turn makes up only a share of the market value of the expenditures. That is, the market value of the expenditures is not equivalent to the basic sector income they generate and is therefore not equivalent to the basic sector expenditures required by the model.

The required basic sector expenditures can be obtained by adjusting the market value of commodity exports, basic investment and basic government spending. The adjustment process, which is illustrated in Figure 2-2, first requires determining gross regional value-added — a measure of the value of the contribution of the primary inputs (the labour and capital employed in the region) to value of production. It is a gross measure because the income to capital is measured before any charges for depreciation are taken into account. Gross regional value-added is determined by subtracting the value of any imported direct or indirect intermediate inputs and any indirect tax payments from the market value of local production and then adding in any subsidy payments made to producers.

The value of the imported intermediate inputs is removed because they produce no value-added in the region. This is true for both the direct intermediate inputs

Figure 2-2

ADJUSTMENTS TO THE EXPENDITURES ON REGIONAL OUPUT AT MARKET VALUE TO DETERMINE THE FLOW OF INCOME TO RESIDENTS FROM REGIONAL PRODUCTION


Expenditures on Regional Output at Market Value
Imported Direct and Indirect Intermediate Inputs
Subsidy Payments
Indirect Taxes
Gross Regional Value-Added
Depreciation
Net Regional Value-Added
Income Not Paid Out to Factors of Production
Income Paid to Non-Resident Factors of Production (Factor Imports)
Income Paid to Resident Factors of Production

used to produce the final product and the indirect intermediate inputs used to produce the direct intermediate inputs. Indirect tax payments, such as the manufacturers sales tax, raise the market value of the output above the value of the primary and intermediate inputs used to produce it. If they were not removed, gross regional value-added would be overstated. Subsidy payments have the opposite effect and have to be added in to prevent gross value-added from being understated.

Once gross regional value-added is determined it can be adjusted to remove depreciation and obtain net regional value-added, a measure of the income to the primary inputs from current production. Another adjustment is then made to remove any net value-added not paid out to labour and capital, such as corporate taxes and corporate retained earnings. This produces a measure of the income paid to labour and capital, but since all of this may not flow to regional residents, any payments to non-residents must also be removed. What remains is the basic sector expenditure flow which is equivalent to the income flow to regional residents from basic sector production.

For the sake of simplicity, all of these adjustments can be combined into one coefficient, M_b, so that basic spending (B) is

$$B = (X + I_b + G_b - M_b) + F + T_b \qquad (1).$$

The equivalent income flow can be shown by letting VA_b be net regional value-added from basic sector production and a_b the share of this value-added paid to regional residents, so that

$$B = a_b VA_b + F + T_b \qquad (2).$$

Non-basic spending includes four expenditure flows:

1. consumption spending (C),
2. non-basic investment spending (I_n),
3. non-basic government spending (G_n), and
4. internal transfers (T_n).

One of these flows, internal transfers (T_n), is a pure income flow, while the other three represent spending on local production. Again, the expenditure flows on local production measured at their market value will exceed the flow of income to regional residents from the production of this output. The adjustments required to bring the two into line are identical to those outlined previously for the basic sector. In the model, these adjustments are included as part of the coefficients g or g′, yet it would be useful to combine them again in a specific coefficient, M_n. Thus non-basic spending (N) is

$$N = (C + I_n + G_n - M_n) + T_n \qquad (3).$$

By letting VA_n be the net regional value generated from non-basic production and a_n the share of this net value-added paid out to regional residents, the equivalent non-basic income flow becomes

$$N = a_n VA_n + T_n \qquad (4).$$

Total regional income is then simply the sum of basic and non-basic sector income measured either as a flow of expenditures or as a flow of income. The concept of income incorporated into these measures is similar to Personal Income in the National Accounts. That is, it is a measure of the net (i.e., after depreciation) factor income received by residents and the transfer income from public and private sources. This income is measured before personal taxes and other direct transfers to government so that it is a gross of tax measure of income.

Set out in this way, the "simple" economic base model is much more complicated than one would suppose from the previous discussion. Moreover, to estimate either the expenditure or income flows in the two sectors requires more data than are normally available at the small-region level. As a result, other variables such as employment are used instead.

Setting out the model in income terms is nevertheless a useful exercise because it shows the desired estimates and therefore provides a standard by which to judge the adequacy of other approaches. More importantly, it provides a guide to help convert the employment multipliers derived from the employment version of the model into income multipliers if these are required.

2.7 THE ECONOMIC BASE MODEL AS AN EMPLOYMENT MODEL

2.7.1 The Structure of the Model

The employment versions of the economic base model are identical in format to the short-run and long-run income versions already discussed. It would be useful, however, to set out the two models in employment terms, since these are the models that will be used in the following chapters.

In the employment models, total regional employment (Y_e) is divided into the part dependent on externally determined spending, or basic employment (B_e), and the part dependent on internally determined spending, or non-basic employment (N_e). Therefore, in equilibrium,

$$Y_e = B_e + N_e \qquad (1),$$

and $$B_e = \bar{B}_e \qquad (2),$$

$$N_e = d + h' Y_e \qquad (3a) \text{ in the short-run model,}$$

or $$N_e = hY_e \qquad (3b) \text{ in the long-run model.}$$

By substituting (2), and (3a) or (3b), into (1) the two employment multipliers can be obtained, with the short-run multiplier (K_{es}) being

$$K_{es} = \frac{1}{1 - h'} = \frac{\Delta Y_e}{\Delta B_e}$$

and the long-run multiplier (K_{el}) being

$$K_{el} = \frac{1}{1 - h} = \frac{Y_e}{B_e} = 1 + \frac{N_e}{B_e} .$$

The coefficients h' and h in the employment models serve the same purpose as the coefficients g' and g in the income models. However, they are now defined in employment terms. They can be interpreted as the number of non-basic workers required to supply the demand for non-basic commodities of one basic or non-basic regional worker. In the long-run model, the coefficient h is an average value equal to the number of non-basic workers per regional worker for the region as a whole. If regional total employment were to change, regional non-basic employment would also change by the average ratio of non-basic to total employment for the region. In the short-run model, the coefficient h' is a marginal value which is lower than the average value; now a change in total regional employment would cause a change in non-basic employment by less than the average ratio of non-basic to total employment for the region.

2.7.2 The Use of Employment to Estimate the Model

If employment is to be used to measure the basic and non-basic sectors, the employment data should correspond to what is required by the model. The income version of the model is set out in terms of income flows measured over a given period of time — one year, for example. The employment data therefore should also be flow data measured over a given period of time. Moreover, if employment is to be used, some common measure of employment is required. Employment data refer to jobs but not all jobs are alike. Some are full-time, others are part-time or seasonal; some full-time jobs involve a standard number of hours, others involve variations due to overtime or layoffs. Consequently, the jobs must be converted to a common base to be counted in a meaningful way. This base could be man-years of employment, with a year of employment defined in some consistent way, such as the number of hours, days, or weeks of employment per year.

2.7.3 Identifying the Two Sectors

The employment versions of the economic base model are taken to be approximations of the income versions. Since regional output, employment and income are interrelated, employment data are used in place of the more difficult-to-obtain income

data. However, the use of employment in place of income creates some difficulties in identifying the basic and non-basic sectors.

In the income versions of the model, the basic and non-basic expenditure flows generate corresponding flows of basic and non-basic income. If employment is to be used in place of income, the basic and non-basic expenditures should also generate corresponding flows of basic and non-basic employment. Basic sector expenditures consist of spending on regional output (commodity exports, basic investment and basic government spending), on regional factor services (factor exports), and on transfer payments (external transfers).

Basic spending on regional output does produce a corresponding flow of employment, so that one component of basic employment is the flow of resident employment associated with the output of basic goods and services. Basic spending on regional factor services may produce a corresponding flow of employment if the spending is on regional labour employed elsewhere, but there is no corresponding flow for the export of the services of regional capital. External transfers also produce no corresponding flow of basic employment since transfer payments are not related to employment. However, transfer payments could be included through another flow — the flow of unemployment. In many regions a large share of transfer payments consists of unemployment insurance benefits and welfare payments which could be approximated by the flow of unemployment in the regional economy.

If the flow of unemployment is included, basic sector activity will consist of three distinct flows measured in man-years:

1. the flow of resident employment engaged in basic production in the region;
2. the flow of resident employment engaged in production elsewhere, and
3. the flow of resident unemployment.

In the non-basic sector, four expenditure flows were identified. Three of them consisted of spending on regional output — consumption, non-basic investment, and non-basic government spending. Each of these will have a corresponding flow of non-basic employment. The fourth expenditure flow, internal transfers, simply involves a redistribution of income among regional residents and it will not likely have any effect on non-basic output or employment so that it can safely be ignored. Thus non-basic employment consists only of the flow of resident employment generated by non-basic production measured in man-years.

2.7.4 Some Problems in Forecasting with the Employment Model

Two additional problems associated with the use of employment in the model should be mentioned and both of them have to do with the use of the employment multipliers in forecasting. The first is the inability of the employment multiplier to take into account the differential effects of a change in basic sector employment on the non-basic sector. When forecasts are made, one change in basic sector employment will have the same effect on the non-basic sector as another change of the same

size. However, not all man-years of basic employment are the same; they may differ in productivity and income. The effect of a change in high-wage basic employment on the size of the non-basic sector will be different from that of a change of the same magnitude in low-wage employment. An income multiplier can take these differences into account whereas an employment multiplier cannot, since it treats all employment alike.

The second problem is more relevant to forecasts made with the short-run than with the long-run model. In the short run, employment may be much less responsive to a change in the regional economy than income. If the regional economy has substantial excess capacity in the non-basic sector, an increase in basic employment may lead to little or no change in non-basic employment. This could occur if the excess capacity permitted output to grow without an equivalent growth in employment. Thus non-basic income would then grow primarily because of the increased returns to capital. The same phenomenon could occur if basic employment fell. In this case, non-basic income could fall faster than non-basic employment if employers maintained their existing work force. Again, it would be the decreased returns to capital that would generate the lower non-basic income. In either case, the forecast change in non-basic employment may not take place, rendering the forecast incorrect.

CHAPTER THREE

THE MULTIPLICAND AND THE MULTIPLIERS FOR A PROJECT

The purpose of this chapter is to explain how the short-run and long-run versions of the economic base model can be used to derive a set of multipliers that are applicable to the appraisal of a project. This is done by first considering the nature of the employment created by a project. Since the multipliers are employment multipliers, a project's employment forms the multiplicand to which the multipliers are applied.

The regional secondary effects are considered next. The multiplier is disaggregated into its various components to show how the regional secondary effects generated by a project depend on the type of labour required to support both a project's output and the induced secondary activity. The result of the discussion is a set of multipliers which are tied to the type of labour required to support a change in regional output and which can take into account the differential effects of a project's employment on a region.

3.1 THE PROJECT EMPLOYMENT

A typical project consists of two distinct phases, a construction phase and an operating phase. In each, the spending on a project will create direct employment in the construction and operation of a project and indirect employment in activities linked to a project as suppliers of inputs. When spent, the incomes earned from the construction and operation of a project will create a third type of employment — induced employment.

From the region's point of view, a project is often motivated by external markets. It may involve some activity that is attracted to the region by its natural resource endowment, its labour supply, or its transport access to other regions. Major projects are usually financed outside the region and the private-sector capital is frequently supported by government assistance or by government spending on project-related infrastructure, or both. Such projects therefore involve basic investment and government spending during the construction phase and export spending on regional output during the operating phase.

The direct and indirect employment created during both phases of a project will lead to an increase in regional basic employment, and it is this increase in basic employment that forms the multiplicand for a project. Set out in this way, the determination of the multiplicand appears to be a relatively straightforward matter. Unfortunately, identifying the relevant multiplicand entails a number of major difficulties.

3.2 DETERMINING THE EMPLOYMENT MULTIPLICAND FOR A PROJECT

The identification of the relevant project multiplicand poses two general problems that apply to both phases and other problems that are specific to each of the two phases. The general problems will be considered first.

3.2.1 Estimating the Direct and Indirect Project Employment

The first general problem is that of estimating the direct and indirect employment created by a project in the region. Estimates of the direct construction and operating employment usually can be obtained from the project proposal's manpower requirements. However, the project appraisal will not normally provide data on the indirect construction and operating employment, and if it does, the data likely will be incomplete. Such estimates therefore have to be obtained from other sources.

Indirect project employment in the region can be estimated by first determining the significant construction and operating input requirements for a project. These can be gleaned from a project's engineering study and through consultation with the project's proposers. The potential supply sources for the significant inputs can then be determined and any likely regional suppliers consulted to estimate what effect the project may have on their employment.

The problem of estimating the regional employment created by a project is related to the more basic problem of how to define the region for a project. Since the size of the defined region is an important determinant of the number of potential supply sources, the two problems are clearly tied together. Thus, when the problem of how to define the region for a project is considered in the next chapter, both problems will be considered again.

3.2.2 The Unit of Measurement

The second general problem involves the measurement of employment in the multiplicand. Although employment is usually measured in terms of the number of jobs, the term "job" is not really a satisfactory unit of measurement for an employment multiplicand. In an income multiplicand, a monetary unit such as a dollar is used as a common denominator to equate the different types of income earned from a project. A job cannot serve this same function because of the very different types of employment included under the term. Thus some common unit of measurement is needed to equate them. One such unit is a man-year of employment where the term "man-year" is defined in some consistent manner such as the number of hours, days, or months of employment per year.

A man-year has merit as a measure of employment because it is commonly used in project proposals and because the employment data often will be available to the analyst in this form. More importantly, such a measure is consistent with the concept of employment found in the multipliers of the economic base model. The employment versions of the model are taken as approximations of the more difficult-to-

estimate income versions, which deal with flows of income measured over some period of time. The employment versions, therefore, also deal with flows over time, but in this case with flows of employment. Since the multipliers from these models are defined in terms of employment flows, a multiplicand measured in terms of man-years would be consistent with the multipliers.

3.2.3 The Employment Multiplicand for the Operating Phase

The operating phase is the more permanent phase of a project in that it is expected to persist over a long period of time. The spending on a project's output will create an annual flow of regional employment, measured in man-years, over a project's life. This employment again will consist of direct employment in the operation of a project and indirect employment in regional activities linked to it. The multiplicand for the operating phase, then, is this annual flow of direct and indirect employment.

The labour supply required to support a project could come from existing regional residents (local labour) or from new regional residents (migrant labour). The nature of the secondary effects on the region essentially depends on the source of labour for the project jobs. Since the secondary effects will differ with the source of labour, the major problem in this phase is to disaggregate the multiplicand into the two broad types of labour, local and migrant. The disaggregation is concerned with the type of labour that ultimately fills the project jobs and not with the type that initially fills the jobs. The distinction between the initial and ultimate labour supply rests on the way the regional labour market responds when the equilibrium in the market is disturbed by a project.

Before a project starts up, the regional labour market will be in equilibrium with a given unemployment rate, a given labour force participation rate, and with rates of in-migration and out-migration appropriate to the unemployment rate. When a project starts up, its initial effect is to reduce the region's unemployment rate and to increase the size of its labour force.

The region's unemployment rate falls because of the direct and indirect jobs created by a project and the induced jobs created by the spending out of the incomes earned on a project. The growth of the region's labour force comes about through an increased labour force participation rate, a reduced rate of out-migration, and an increased rate of in-migration. The labour force participation rate rises because the increased employment opportunities created by a project and the reduced unemployment rate attract regional residents into the labour force and encourage existing labour force members who otherwise would have dropped out to stay. These same motivations encourage regional residents who otherwise would have left the region to remain, and they also attract new residents to the region.

Over time, the growth in the size of the labour force will cause the unemployment rate to rise again, which in turn will slow down the growth of the labour force. As the unemployment rate rises, the labour force participation rate and the rate of in-migration will fall, while the rate of out-migration will rise. Eventually, after all the repercussions on the regional labour market have worked themselves out, the

regional labour market will reach a new equilibrium. Again, at this new equilibrium, there will be a given unemployment rate, a given labour force participation rate, and rates of inflow and outflow of labour appropriate to the unemployment rate. However, the region's labour force will be larger in absolute terms, as will the amount of employment and, probably, the amount of unemployment.

The difference between the new and the initial equilibrium determines the source of the labour that will ultimately support the increase in regional output brought about by a project. If the unemployment rate and the labour force participation rate at the new equilibrium are identical to those at the initial equilibrium, the ultimate labour supply would have come from regional residents who otherwise would have left the region or from new regional residents who would have migrated to the region. A new equilibrium with a lower unemployment rate and a higher labour force participation rate means that part of the ultimate labour supply would have come from these sources as well as from potential out-migrants and new regional residents.

The above discussion implies that the labour supply ultimately required to support the increase in regional output could come from local labour (as in the short-run version of the economic base model) if fewer regional residents left the region, if the regional unemployment rate fell, and if the regional labour force participation rate rose. But it could also come from migrant labour (as in the long-run version of the economic base model) through an increased inflow of new regional residents. A third and more likely possibility is that the labour supply would come from a combination of local and migrant labour.

3.2.4 The Employment Multiplicand for the Construction Phase

The construction phase is usually of short duration compared with the more permanent operating phase. Thus, the direct employment created during the construction of a project and the indirect employment in the linked regional supplying firms will normally last for only a short period of time. Moreover, the indirect regional employment is likely to be of little consequence since in most projects imports tend to make up a large share of the purchased material input content of building materials, machinery, and equipment.

The employment created during the construction phase could be filled by local and by migrant labour. Any migrant labour attracted to a project will likely work in the region only during the construction phase and then leave for employment elsewhere. Thus migrants working during the construction phase are only temporary residents in contrast to those employed during the operating phase who become new regional residents. Moreover, since the migrant construction-phase workers will have permanent residences elsewhere, their incomes will not be part of the region's income but, rather, will be payments for the services of imported factors of production. Such employment is not part of the region's employment multiplicand. Therefore, the first major problem in determining the employment multiplicand for the construction phase is that of dividing employment into the shares filled by regional residents and non-residents.

While non-resident or migrant employment is not a part of the region's employment multiplicand, the presence of non-resident workers during the construction phase will have an impact on the regional economy generated by their spending in the region. The impact they have will vary with the nature of the project. In major projects, the direct construction labour force tends to live in construction camps where both food and housing are provided. In such cases, most of the income earned by non-resident workers will flow to other regions and their regional expenditures will make up only a small share of the income earned. If these workers are required to provide their own food and housing, the value of regional purchases will increase. This tends to be true of smaller projects where the non-resident labour content is not likely to be large.

Since non-resident spending will have some impact on the regional economy, the problem arises of how to include it in the employment multiplicand. In many respects the problem posed by non-resident workers is similar to that of the regional tourist industry, where the relevant employment multiplicand is not the number of tourists but the man-years of employment generated by tourist spending in the industry. The same principle applies to the non-resident workers: the relevant multiplicand is not the man-years of non-resident employment but the man-years of regional employment generated by their spending.

While it is possible to specify what the relevant multiplicand should be, estimating it is a very different matter. A number of approaches to the problem are possible: making crude estimates of the man-years of regional employment directly related to non-resident workers' spending, weighting the man-years of non-resident employment by the probable share of income spent in the region, or simply excluding the non-resident workers entirely, because technically they are not regional residents and should not be included in the regional employment multiplicand. However, since these workers will have an impact on the region, a crude estimate of the regional employment directly related to their spending is probably the best approach.

The relevant employment multiplicand for the construction phase, then, consists of the direct and indirect regional project employment filled by local labour and the employment (also filled by local labour) created by the spending of non-resident construction workers in the region. Again, this employment is an annual flow measured in man-years.

3.3 THE MULTIPLIERS FOR A PROJECT

The project multipliers are derived from the two versions of the economic base model, which essentially represent polar cases of the resources, and especially the labour resources, required to support an increase in regional output. The labour resources in the short-run model are drawn from the region itself whereas in the long-run model they are drawn from other regions. The differences in the secondary effects between the two models are related to the type of labour required to support the increase in regional output. The link between the type of labour and the nature of the secondary effects can be made more specific by disaggregating the multiplier into its components.

3.3.1 The Nature of the Secondary Effects

The employment multiplier of the economic base model, K, is the sum of a geometric progression equal to

$$\frac{1}{1-h},$$

where h now represents either the average or marginal ratio of non-basic to total employment. The multiplier includes both the effect due to the multiplicand (which is equal to 1) and the secondary effects (K−1), so that

$$K = 1 + (K - 1).$$

The multiplicand measures the initial impact on the region of the new direct and indirect basic employment created by a project. The secondary effects are a measure of the induced non-basic employment created by the regional spending out of the incomes earned on a project (the first-round effect) and by the regional spending out of the incomes earned from the induced non-basic activity (the subsequent-rounds effect). This means that (K−1) can be divided into two parts: the secondary effects associated with the first round, and the secondary effects associated with the subsequent rounds. The total secondary effects are then

$$\begin{aligned} K - 1 &= h + h\,(K_s - 1), \\ &= hK_s \end{aligned}$$

where K_s is the subsequent-rounds multiplier.

The direct and indirect basic employment represented by the multiplicand could be filled either by new regional residents (migrant labour) or by existing regional residents (local labour). The secondary effects on the region will differ according to whether migrant or local labour fills the new direct and indirect jobs. The difference, however, will affect only the first round of the secondary effects and not subsequent rounds since the latter will be the same no matter where the project labour comes from. To see this, we shall consider the first-round effect for the two types of labour and then go on to consider the subsequent-rounds effect.

If a migrant fills one of the new direct or indirect jobs, the region's population will increase. The first-round effect, then, is a long-run effect, since the migrant can be viewed as demanding a package of locally produced commodities equal to the average for the region as a whole. This means that the coefficient h will be equal to the average non-basic to total employment ratio for the region as a whole. This coefficient will be designated h^m, where the superscript m stands for migrants to the region.

Local residents filling the new direct and indirect jobs will already be consuming a package of locally produced commodities. The first-round effect of local employment is a short-run effect generated by the extra spending out of the extra income earned by the local residents. The coefficient h is now a marginal value which is less than the average value for the migrants to the region. The coefficient h for local labour will be designated as h^1, where the superscript 1 stands for local labour and where h^1 is less than h^m.

The subsequent-rounds effect depends on the source of the labour filling the new non-basic jobs. The new non-basic jobs could be filled by local labour, by migrant labour, or by some mix of the two. Thus the coefficient h in the subsequent-rounds multiplier K_s could have an upper limit value of h^m, a lower limit value of h^1, or some value h^b between the two if a mix of local and migrant labour is involved.

Combining the first-round and subsequent-rounds effects results in three sets of multipliers:

1. A pure migrant labour multiplier

In this case all of the new jobs — direct, indirect, and induced — are filled by migrants to the region. This is the long-run multiplier and its value is

$$\begin{aligned} K_m^m &= 1 + h^m K_s \\ &= 1 + \frac{h^m}{1 - h^m} \\ &= \frac{1}{1 - h^m} . \end{aligned}$$

2. A pure local labour multiplier

In this case all of the new jobs — direct, indirect, and induced — are filled by local labour. This is the short-run multiplier and its value is

$$\begin{aligned} K &= 1 + h^1 K_s \\ &= 1 + \frac{h^1}{1 - h^1} \\ &= \frac{1}{1 - h^1} . \end{aligned}$$

3. A mixed labour multiplier

The most likely case consists of a mix of short-run and long-run effects where all of the new jobs are filled by some mix of migrant and local labour. Tying the

multiplier to the type of labour filling the new direct and indirect jobs results in two multipliers — one for migrant labour (K_b^m) and one for local labour (K_b^l):

$$K_b^m = 1 + h^m K_s$$
$$= 1 + \frac{h^m}{1 - h^b}, \text{ and}$$

$$K_b^l = 1 + h^l K_s$$
$$= 1 + \frac{h^l}{1 - h^b},$$

where $h^m > h^b > h^l$.

3.4 APPLICATION OF THE MULTIPLIERS TO PARTICULAR PROJECTS

The previous section identified three types of multipliers: a pure local labour multiplier, a pure migrant labour multiplier, and a mixed labour multiplier. The multipliers are related to the labour supply required to support both the output of a project and the secondary effects but they differ according to whether they are concerned with local labour, migrant labour, or some mix of the two.

Now that the three types of multipliers have been set out, the primary concern is to determine how they can be used for particular projects. While each of the multipliers is applied to the employment multiplicand for a project, the type of multiplier used depends on the source of the labour which will ultimately support the output of a project and the secondary effects. The application of the multipliers therefore depends on an analysis of the regional labour market and the way it responds when its equilibrium is disturbed by a project. This will be considered by looking at each of the two phases of a project.

During the construction phase, both local and migrant labour may fill the new direct jobs in construction and the new indirect jobs in the linked supplying firms. The short duration of this phase implies that any migrant labour attracted to a project will probably consist of only temporary regional residents. The earlier discussion suggested that migrant employment not be included in the multiplicand but that it be adjusted to include any resident employment directly created by the spending of non-resident labour during this phase. Therefore only local labour will be included in the multiplicand for the construction phase.

The secondary effects of the construction phase are also likely to be of relatively short duration since they will last only as long as the phase itself. Given its temporary nature, it would be expected that the secondary effects will involve little if any migrant labour. Again, if any migrant workers are hired they will represent imported labour from the region's point of view, since they are likely to leave once the phase ends. Moreover, any spending during their stay in the region will probably have little impact on the regional economy. This means that for all practical pur-

poses, all of the labour employed during the construction phase will be local and the relevant multiplier is the short-run or pure local labour multiplier.

An exception could arise if the project had an extended construction period of, say, five to ten years. The inflow of migrant labour in this case may have a more permanent effect on the region and lead to an expansion of the non-basic sector to serve the needs of the migrant workers and their families. Migrant employment would now enter into the employment multiplicand and possibly into the coefficient for the secondary effects as well if any migrant labour were involved in the non-basic sector. However, such cases are an exception rather than the rule.

The ultimate labour supply for the operating phase cannot usually be determined without an analysis of a project's impact on the regional labour market. This requires the analyst to be familiar with both the manpower requirements for a project and the conditions in the regional labour market. If the regional economy has a high unemployment rate in relation to other regions and a high rate of net out-migration, it is possible that the ultimate labour supply required to support both the project and the secondary effects could come entirely from local labour. This is likely to be true especially if the project is a small one; in this case a pure local labour multiplier would be appropriate.

A more typical project is one that employs both local and migrant labour. The skilled and managerial manpower requirements for many projects often cannot be satisfied by the regional labour market so that such labour may consist of migrant workers. It is possible, however, for the other direct, indirect and induced jobs to be filled by local labour. This is again likely to be true if the region's unemployment rate is high in relation to others, if it has a high rate of net out-migration, and if the project is a small one. Therefore two multipliers would be called for — one for local labour and one for migrant labour. While they would differ in the coefficient used for the first round of the secondary effects, they would both have the same coefficient for the subsequent-rounds effect, a coefficient for local labour.

Projects which employ migrant labour for all of the direct, indirect and induced jobs are rare. Such cases could arise if the region's unemployment rate is low in relation to others and if it is experiencing an overall net inflow of labour. If this is true, then the pure migrant labour multiplier may be the appropriate one.

It is apparent that the multipliers applicable to the operating phase depend critically on the analysis of a project's impact on the regional labour market. It is this analysis that determines the breakdown between local and migrant labour in the multiplicand and in the secondary effects. Such an analysis is also required to estimate the welfare change for the nation since the social opportunity cost of the labour required to support a project also depends on where the labour comes from.[1] It is important that the labour supply for the appraisal of a project be consistent with that used in the multipliers. Therefore the two should be based on the same analysis of the regional labour market effects.

1 See Evans, John C., *A Manual for the Analysis and Appraisal of Industrial Projects in Canada*, forthcoming.

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CHAPTER FOUR

SELECTING THE REGION FOR A PROJECT

The first step in estimating the multipliers for a project is to select the specific geographic area or region for which the multipliers are to apply. The selection of the region is based on three interrelated criteria: the purpose of the study, the nature of the project, and the availability of the data.[1]

Most regional multiplier studies are concerned with a project's impact on the employment opportunities in the area immediately surrounding the location of a project. It would seem logical, therefore, to begin the process of defining the region by looking at the location of the potential local labour supply for a project. This is done in the first section of the chapter. The nature of the project is also considered in this section but is covered more specifically in the second, where some comments are provided on the different phases of a project. The third section deals with the problem of data availability. The last section provides a comprehensive example of regional selection designed to illustrate many of the issues raised in the chapter.

4.1 DEFINING THE DESIRED REGION

The location of the potential local labour supply for the direct labour engaged on a project involves the likely labour commuting area for a project. The direct labour supply area includes the place of residence of any existing residents drawn to a project as well as the likely place of residence of any new residents. Since it includes the area of the direct workers' residence, it will also coincide with the area where the direct labour income from a project will be earned.

The direct labour supply area will normally be the same as the area where most of the direct labour income earned from a project is spent. Since the secondary effects arise from the spending out of the income earned on a project, the direct labour supply area will also coincide with the area where the local secondary effects will occur. The direct labour supply area would then seem to be the logical choice for the region, although in some cases it may be too small.

One reason for this is that an important share of the direct labour income earned on a project may be spent outside of the direct labour supply area. This could arise if the direct labour supply area were part of a nearby urban center's trading area. The urban center may be far enough away from a project to preclude daily commuting, but it could be sufficiently close to allow infrequent but major shopping trips for consumer durables and services. If this were the case, some of the secondary effects induced by the spending out of the direct labour income would occur in the urban center, and the region should be expanded to include it as well.

[1]A fourth criterion, the model selected, is also important but is not dealt with here since the model has already been determined.

The discussion implies a somewhat altered definition of the size of the relevant region for a project — one that involves the area in which the bulk of the direct labour income is spent rather than earned. In most cases, however, the two areas will coincide. As a matter of procedure, the direct labour supply area should be determined first on the basis of the probable daily commuting pattern for a project. Once this is done, the links between this area and the adjoining areas can be evaluated to discover whether any significant share of the direct labour income will be spent in the adjoining areas. If this is to take place, the region should be defined to include them. It should be noted that the selected region must be contiguous if it is to be relevant for a multiplier study.

A project will also generate indirect labour income earned by the workers employed in the linked supplying firms. The spending out of this income will also induce secondary effects and the question arises of how these effects can be included. If the linked supplying firms are located in the direct labour income spending area, any local secondary effects induced by the spending out of the income earned by the indirect workers will be included automatically. In most cases, however, the supplying firms will be located elsewhere in the nation or even in another country.[1] The problem then is how to include the secondary effects and still retain a local or regional perspective.

The problem can be approached by considering the significance of the supplying firms in terms of the extra indirect employment generated by a project as well as the location of the suppliers. If little indirect employment is likely to be generated and if the firms are not located in the direct labour income spending area, the best course of action is simply to exclude them from the analysis, because any effects generated by the spending of the indirect labour income earned by the workers will be of little consequence. If some of the suppliers are significant and located in an area adjacent to the defined region, it is possible to include them by broadening the defined region. Although this would alter the definition of the region again, it is a reasonable way to handle the problem.

If the significant supplying firms are located elsewhere in the nation, the only way to include them and to continue to use the economic base model as the framework of the analysis is to use a multi-region approach. In such an approach, separate regions are defined for a project and for the significant linked supplying firms, which permits an analysis of the impact of a project on each of the local areas affected. An example might be a project involving a major steel complex with significant domestic coal and iron ore suppliers located elsewhere. A multi-region approach is not only viable in this case but also sensible given that the local effects are likely to be important and that separate regions could be defined.

This section began by being rather specific as to how the desired region could be defined. The initial definition of the direct labour supply area for a project was then modified to recognize that the area in which the direct labour income is spent may differ from the area in which it is earned. The definition was further modified to allow for the inclusion of any secondary effects generated by the spending out

[1]No consideration, of course, is given to any secondary effects outside of the country.

of the indirect labour income earned in the linked supplying firms. The result is a set of general statements rather than specific guidelines on how to define the relevant region.

It should be apparent that the analyst has a good deal of latitude in the selection of the desired region. The purpose of the multiplier study is to provide a guide to the geographic perspective to be taken. The nature of a project, however, is also important in selecting the desired region (or regions). This is true if the secondary effects generated by the indirect labour income are to be included. But it is especially true if the location of the secondary effects differs for the operating and construction phases. This topic will be considered in the next section.

4.2 REGIONAL SELECTION AND THE PHASES OF A PROJECT

The typical project consists of two distinct phases: a construction phase and an operating phase. The previous comments have dealt essentially with the operating phase. This section considers whether the definition of the region might be different when both phases are taken into account.

The inclusion of the construction phase will not usually require a change in the way the region is defined. It is of relatively short duration in most projects when compared with the more permanent operating phase. As a result, the income earned during the construction phase by the direct labour engaged in constructing a project and by the indirect labour engaged in producing the required purchased inputs will be much smaller than the income earned over the course of the operating phase. Most projects have a large purchased input content in the form of building materials, machinery, and equipment. These inputs will tend to come from widely scattered suppliers and will usually result in little additional indirect employment and generate little additional income to labour in the areas where they are produced. The direct construction labour will tend to be drawn from the same geographic area as the operating labour so that the local secondary effects will probably be concentrated in the same region as that defined for the operating phase. Thus no adjustment in the definition of the region will be required for the two phases.

Major projects, such as a new steel-making complex, a new mine, a new hydroelectric generating plant, or a new, large-scale natural gas pipeline, provide an exception to the above comments. The construction phase for such projects will take a longer period of time, although it will still be of short duration when compared with the operating phase. This type of project will also employ a large construction labour force and require substantial amounts of purchased inputs from suppliers. While the suppliers may still be widely scattered, the purchases from some of them could generate significant amounts of extra indirect employment in the areas where the inputs are produced. The direct labour engaged in constructing most major projects often includes a large share of migrant construction labour, which tends to be housed in construction camps at the site of a project. The income earned by these workers tends to be spent elsewhere for the most part.

The region (or regions) appropriate for the operating phase in major projects may not be satisfactory for the construction phase for two important reasons. First, the direct labour income spending area will likely differ in the two phases. Some of the construction labour for a project may commute to the project site daily or come from the same area but live in the construction camps during the construction period. The income earned by such labour will tend to be spent in the same area as the income earned by the direct labour in the operating phase. A large share of the direct construction labour, however, may be non-resident and the bulk of their income may be spent elsewhere. The direct labour income spending area for the construction phase, therefore, will be larger than for the operating phase. The second reason is that the location of the significant input-supplying firms for the two phases need not and likely will not be the same.

The fact that the region (or regions) appropriate for the operating phase may not be the same as for the construction phase is not a serious problem in itself. The construction phase in major projects may result in important secondary effects and it may be useful to consider the two phases separately. It is only when the two phases are considered together and the analyst seeks a compromise region or set of regions that the more difficult problems of definition arise. This is true not only because different geographic areas are involved but also because the two phases involve different time spans and different sized multiplicands. There are no generally acceptable solutions to these problems. The solutions adopted essentially depend on the overall purpose of the particular study and the two other general criteria for regional selection — the nature of the project and the availability of data.

4.3 THE PROBLEM OF DATA AVAILABILITY

The employment multipliers of the economic base model are usually estimated from published Census data on the labour force by industry. Such data are available for geographic areas determined by the statistical agency that collects them, Statistics Canada. The amount of data available in the published Census reports varies with the size of the geographic area. The most complete data are available for very large geographic areas such as Canada and the provinces, but the quantity of data tends to decrease as the size of the geographic area becomes smaller.

This leads to two major problems in the selection of a region for a multiplier study. First, the desired region selected by the analyst may not correspond to any of the subnational areas used to report Census data. If this is true, the size of the desired region will have to be adjusted to make it correspond to the Census area closest in size to the desired region. Second, even if an adjusted region is selected, the published data available for an area of this size may not provide sufficient detail to estimate the multipliers.

There are two ways to handle this problem. The simplest is to redefine the region to make it equivalent in size to the Census geographic area for which sufficient data are available. This will usually lead to the use of the larger regions, although in some

cases, it may lead to the use of the smaller ones.[1] The other alternative is to obtain the required detailed data from a special tabulation of unpublished data for the chosen geographic area. While the use of unpublished data is the preferred solution, obtaining a special tabulation from Statistics Canada is more expensive, and more importantly, may mean a long wait. The second alternative is clearly not a satisfactory solution for multiplier estimates that have to be made relatively quickly.

The problem of data availability, then, is clearly an important consideration in selecting the region for a multiplier study. This will become even more apparent in subsequent chapters when the type of data required to estimate the multipliers is discussed in detail. At this stage it is sufficient to note that data availability often compels the choice of a region different from the desired region. Moreover, since the choice is clearly tied to the availability of data, the analyst will have to carefully define the type of data needed before finally selecting the region.

4.4 AN EXAMPLE OF REGIONAL SELECTION

This section illustrates the problems of regional selection with an example drawn from an actual project, the proposed development of coal deposits in northeastern British Columbia. In addition to the development of the mines, the project included the construction of a coal processing plant, transportation facilities to move the coal to markets outside of Canada, and a new town to house the workers in mining and in the activities linked to mining. While the proposed project was a major one, the problems of regional selection were not untypical of those found in many projects.

The three criteria described earlier (the purpose of the study, the nature of the project, and the availability of data) all played a part in the final selection of the region for this project. In the following discussion the purpose of the study is considered first. The other two criteria appear later in the discussion. The selection process is set out in a series of steps to help the reader relate the general procedure outlined in the previous section to the specific application provided here. In practice, many of the steps would be combined so that the process is somewhat simpler and quicker than the discussion would make it appear.

4.4.1 The Purpose of the Study

The area in which the proposed project was to be located is currently undeveloped. There are, however, nearby population centers which had experienced relatively high unemployment rates and declining populations. The objective of the multiplier study was to determine the effect of the project on the development of the area and on the employment opportunities of the residents in the nearby centers. The narrow geographic perspective taken by the study is similar to that of many regional multiplier studies, and in this study it was important in helping to resolve a number of conflicts that arose in the selection of the region.

[1]Chapter Six provides an example of the use of a smaller region.

4.4.2 Defining the Direct Labour Supply Area for the Operating Phase of a Project

The initial step in selecting the relevant region was to define the direct labour supply area for the project. This was done first for the operating phase since it is the more permanent phase and of greatest concern in most projects.

The proposed mines in the example project were to be located in the Peace River South area of the Peace River-Liard Regional District. The mines were about 100 kilometres southeast of the town of Chetwynd; the proposed new town was to be located about 15 kilometres north of the mines. All of the proposed road links to the new town were to the north to Route 97 with the town of Chetwynd and the city of Dawson Creek. An 86-kilometre road from Chetwynd to the new town was to be constructed first and a second road of 90 kilometres from Arras on Route 97 (about 15 kilometres west of Dawson Creek) was to be built later.

It was expected that most of the direct labour for the project would live in the new town, although some of the direct workers would commute from nearby urban centers and their surrounding rural areas. Given the distances involved, daily commuting from Dawson Creek was thought unlikely but not impossible. The distances dictated against a daily commuting area extending to the communities north of Route 97. This meant that Route 97 between Chetwynd and Dawson Creek would become the northern boundary of the direct labour supply area, with the area extending south to the proposed mines.

4.4.3 Defining the Direct Labour Income Spending Area

The next step was to determine whether the direct labour income spending area would be different from the direct labour supply area. Since most of the direct labour for the project was expected to live in a town which did not yet exist, this step required an investigation of what functions the new town might perform and what its links with other nearby centers might be.

Given the new town's location, its proposed transport links with other centers, and the resource base of its hinterland, it seemed clear that it would be a residential community dependent on the exploitation of the resources in its immediate hinterland. The primary resource-based activity, of course, would be coal mining but it was possible that other resource-based activities in lumbering, oil and gas production, and tourism might be developed. Compared with coal mining, these other activities would probably be unimportant. The new town was likely to have no other major functions. The lack of an agricultural hinterland meant that it could not serve as an agricultural service center and its proposed transport links dictated against it becoming a service center for other communities.

The limited functions performed by the new town implied that most of the goods consumed by its residents would be imported from elsewhere. The new town was also likely to be a large importer of services, especially in its early years. (However, these would be expected to decline as the town grew and became able to provide many services for itself.) It would therefore probably be dependent directly or in-

directly on nearby communities for many of the commodities consumed by its residents. This meant that the nearby centers had to be investigated to discover what functions they performed and whether they could serve as a supply source for the new town.

The logical choice as a supply source was the nearby city of Dawson Creek, which is the largest city both in the Peace River South area and in the whole Peace River-Liard Census District. Census reports, road maps, published railway guides, provincial government reports, regional planning reports, and other sources of information on the area were consulted to discover the types of functions Dawson Creek performed. This type of information is required for the analyst to become thoroughly familiar with the region under study. It is also necessary in order to obtain the data for the economic base model, as shall be seen in subsequent chapters.

The information collected showed that Dawson Creek occupies a strategic location within the Peace River-Liard's transportation network. It serves as the District's primary link with Alberta (the supply source for most manufactured goods consumed in the District) because it is both the terminus for the Northern Alberta Railway and the District's main truck transportation center on the route from Grand Prairie and Edmonton. It is also a junction point for Route 97 (the Hart Highway) from southern British Columbia and the Alaska Highway, the route to northern British Columbia and the Yukon. Finally, it is located on the British Columbia Railway, providing rail access to the South and to the North.

Dawson Creek's strategic location has allowed it to develop as the Peace River-Liard's most important service center. It functions as a transport and storage center and as a wholesale center for the whole District. It also serves as a communication center, being the northern district headquarters for B.C. Telephone and having the District's only television station. Finally, it serves as a local retail and service center for other communities and for the rural area of the Peace River South.

Given Dawson Creek's importance in both the Peace River South area and the Peace River-Liard Regional District, it would be expected that initially it would serve as both a retail and service center for the new town. As the new town grows, it should be able to provide more retail and service functions for itself although it will likely continue to depend on Dawson Creek for regional service functions, such as transportation, storage, wholesale, communications, and the other services Dawson Creek provides for the communities in the Peace River-Liard Regional District.

The development of the new town to the south of Dawson Creek would also be expected to strengthen Dawson Creek's competitive position in relation to other centers in the Peace River-Liard Regional District and especially in relation to the next largest center, Fort St. John. The population growth to the south of Dawson Creek will increase the size of the total population it can serve and thus increase its attractiveness as a service center. It would be expected, then, that Dawson Creek would be significantly affected by the development of the new town.

Given Dawson Creek's position within the Peace River South area, it seemed likely that the bulk of the direct labour income not spent in the communities in which

the direct workers lived would be spent in Dawson Creek. Since Dawson Creek was part of the direct labour supply area for the project, the direct labour income spending area and the direct labour supply area were expected to coincide in this case. Furthermore, it was recognized that some of the spending out of the direct labour income earned on the project might leak out to adjacent areas of Alberta because of the good road links between the defined region and Alberta and because of the absence of a retail sales tax in that province. However, the distances also implied that most of the direct labour income would in fact be spent in the defined region.

4.4.4 Adjustments for Spending Out of the Indirect Labour Income

The third step involved determining the location of any significant indirect or linked supplying firms so that adjustments could be made to include the spending out of the indirect labour income earned on the project. In the example project, the significant linked activities in the operating phase were to be the transportation of the coal by rail to a proposed port at Prince Rupert and the handling of the coal at the port for shipment to export markets. Any extra railway employment resulting from the project would be scattered along the route of the rail line whereas the extra employment in the port would be in Prince Rupert. The area in which the significant indirect labour income would be earned and likely spent was very large and to have included it in the defined region would have required a substantial broadening in the definition of the region. This would have conflicted with the narrow definition required by the purpose of the study.

Since the amount of significant indirect employment was small in relation to the direct employment, the conflict was easily resolved by simply ignoring the indirect labour income in the definition of the region. This is the usual solution in most regional multiplier studies.

4.4.5 Adjustments for the Availability of Data

The fourth step was that of adjusting the defined region to conform to the area for which the data required to estimate the multipliers were available. The published Census reports were consulted to determine the geographic areas for which data were available and the amount of data available for each area. Essentially, the desired region consisted of the Peace River South Subdivision of the Peace River-Liard Census Division. In the Census, published data were available for the whole Census Division and for the City of Dawson Creek in the Peace River South Subdivision, but not for the Subdivision itself. The whole Census Division was clearly too large for the multiplier study, while Dawson Creek, even though it had a large share of the Peace River South population, did not represent all of it. Moreover, neither set of Census data was detailed enough to estimate the multipliers. Thus it was necessary to obtain a special Census tabulation for the Peace River South Subdivision. As a result, the desired region and the area for the data set coincided, but only because unpublished data were used.

4.4.6 Adjustments for the Construction Phase

The final step in selecting the relevant region relates to the construction phase of the project. The concern here is whether the region selected for the operating phase is also satisfactory for the construction phase. The example project was a major one with an extended construction period. In addition to the development of the mines, the proposed construction activity included a coal preparation plant, a new town, the access roads to the new town and the mines, a new rail line, the rebuilding of existing rail lines and a new port with its related infrastructure. Most of this activity was to take place within the region selected for the operating phase but some was to take place elsewhere in British Columbia.

It was expected that most of the construction labour for the part of the project within the selected region would be housed in construction camps but that some would live in the new town as it was constructed. If any daily commuting to work took place, it was reasonable to assume that the workers would be drawn from the same area as the direct labour for the operating phase.

Manpower data from the project's feasibility study indicated that the region suffered from a shortage of skilled construction workers and that such workers were usually imported from the rest of British Columbia and from Alberta during the peak summer construction period. Given the size of the project, it was expected that a large share of the direct construction labour would be non-resident, implying that a large share of the direct labour income earned by the construction workers would probably be spent outside of the selected region.

The relevant region for the construction phase appeared to be much broader than the one selected for the operating phase. The expected large share of direct construction labour income that would be spent outside of the selected region and the fact that some of the construction activity would also take place elsewhere would clearly produce such a broad region. However, the stated purpose of the study required the adoption of the narrower definition for the operating phase. The conflict created by the nature of the construction phase and the stated purpose of the project could only be resolved by the analyst's judgment, and in this case, it was decided to stick with the narrow definition.

No consideration was given to any indirect construction activity other than that which took place in the selected region. The material inputs required for the construction phase would have been provided by a wide variety of suppliers and some could have been significant. The stated purpose of the study again overrode any detailed consideration of the secondary effects outside of the narrowly defined region, so that all such indirect construction activity was ignored.

4.4.7 Concluding Comments

The discussion of the selection of the region for the example project showed that there was a large element of judgment on the analyst's part. While all three of the selection criteria came into play, one — the purpose of the study — was para-

mount in resolving any conflicts that arose, as it normally should be. The example also demonstrates the importance of defining the purpose of the study carefully before attempting to select the region for a project.

The multipliers for the Peace River South area were estimated with the use of unpublished Census data. Most multiplier studies will not be able to afford the luxury of the waiting time often required to obtain a special tabulation. Therefore a second example region has been chosen to illustrate the estimation of the multipliers in later chapters. The initial multiplier estimates for this example region (Cape Breton County, Nova Scotia) can be made with the use of published data. Some refinements of the estimates the analyst may wish to pursue will also require unpublished data, but this tends to be true for all regions. The selection of the example region posed no special problems other than adjustment because of data availability. Thus it will be more useful to discuss the selection of this region after the data requirements to estimate the model have been set out in the next chapter.

CHAPTER FIVE

HOW TO MEASURE THE ECONOMIC BASE

The multipliers developed in Chapter Three require estimates of the size of a region's basic and non-basic sectors. This chapter first summarizes the alternative methods to measure the two sectors and then provides an extended discussion of the particular method likely to produce the most satisfactory results given the time and money constraints typically faced by the analyst.

This approach makes use of location quotients and informed judgment to allocate published Census data between a region's basic and non-basic sectors. These estimates can then be used to derive the coefficient h^m for the pure migrant labour multiplier. The data on the size of the two sectors along with other data are also used in Chapter Seven to estimate the coefficient h^l for the pure local labour multiplier. The primary emphasis in this chapter is on the technical aspects of measuring the two sectors. The following chapter provides an example to illustrate how the recommended approach can be applied.

5.1 ALTERNATIVE METHODS OF MEASUREMENT

The literature on the economic base model offers a number of alternative approaches to measure a region's basic and non-basic sectors and they fall into two broad categories — direct and indirect methods. Direct methods employ regional surveys to obtain the data directly, while indirect ones use existing data and techniques to allocate these data between the two sectors.

Although the direct methods generate their own data and have the potential to produce the best results, regional surveys are not without their limitations and are time-consuming as well as costly to carry out. Thus they are not really a practical alternative to the cheaper and quicker indirect methods. The latter typically make use of Census data on the labour force by industry, which are then allocated to the region's basic and non-basic sectors by means of several techniques such as assumptions, location quotients, minimum requirements, or a combination of the three. For one reason or another all of these techniques produce unsatisfactory estimates, but location quotients produce the least unsatisfactory estimates.

The approach to measurement suggested in this Guide is a combination of the above methods. It uses indirect methods in that the initial allocations are based on Census data and location quotients; but it also uses direct methods in that the final allocations may be based on other information along with location quotients. The particular method selected for the final allocations depends on the cost and effort required to obtain the other information. The approach will be set out in detail in the following section.

5.2 THE FLOWS TO BE MEASURED

Three flows of basic sector labour force activity were identified in Chapter Two:

1. resident employment engaged in basic regional production,
2. resident employment engaged in production elsewhere, and
3. resident unemployment.

The non-basic sector included only one flow — resident employment engaged in non-basic regional production.

The indirect methods, such as location quotients, are intended to allocate Census data on resident employment in the region to the basic and non-basic sectors. They are concerned, then, with measuring only the two flows of basic and non-basic employment engaged in regional production. The first task is to show how location quotients and informed judgment can be used to measure these two flows. The subsequent discussion will show how a third flow, resident unemployment, can be measured and then offer some comments about the remaining flow, resident employment engaged in production elsewhere.

5.3 CENSUS DATA AND THE APPROACH TO MEASUREMENT

Before the approach to measurement is set out, it would be useful to compare the data required to measure the two sectors with the data available in the published Census reports. The economic base model deals with flows of activity, such as man-years of employment, measured over some period of time. The indirect methods used to measure these flows make use of techniques to allocate data on resident employment by industry to a region's basic and non-basic sectors. Therefore, the required data are for the flow of resident employment by industry for a region.

The published Census data normally used to estimate the multipliers are drawn from the Census of the labour force and refer to the resident experienced labour force by industry. In the Census the labour force is divided into two groups — those with experience and those with no experience or no recent experience. The most recent Census for which data are available (the 1971 Census) defined the experienced labour force to include those who were employed during the week prior to the Census (June 1, 1971) or those who were seeking work but had been employed at some time since January 1, 1970. The employed were asked to report their industry activity for the week prior to the Census whereas the unemployed were asked to report their industry activity on the basis of their job of longest duration since January 1, 1970. Employed persons with two or more jobs were asked to report their industry activity for the job in which they worked the most hours. The rest of the labour force included those seeking work without previous work experience and those who had last worked before January 1, 1970.[1]

The experienced labour force data, therefore, are not a measure of employment because they include both the employed and the unemployed. While it is possible to obtain employment data by industry through a special Census tabulation, they

[1]See Statistics Canada, *1971 Census of Canada, Introduction to Volume III*, Part 4, Cat. No. 94-738.

still would not provide a measure of the flow of employment by industry but simply a count of those employed in the week prior to the Census. Workers with a wide variety of employment experience are included in this group: full-time, part-time and seasonal workers as well as those with more than one job. Such data are not converted to a common base and even if they were, they would not necessarily be typical of the flow of employment by industry for a longer period of time, such as a year.

The published Census data, then, are only an approximation of the data required to estimate the model. The approach used to estimate the size of the two sectors is meant to refer to employment rather than the experienced labour force. In the subsequent discussion, the experienced labour force data will be treated initially as if they referred to employment. At the end of the chapter, a quick but crude adjustment will be made to show how they can be converted into employment data. It must be recognized, however, that the adjusted estimates will be only an approximation of the employment flow required for the model. Since such data are not available at the regional level, nothing can really be done about the problem.

One other characteristic of the Census data is important to the discussion of the allocation technique; it is mentioned only briefly now, although its full significance will be discussed later. The industrial classification used for the experienced labour force by industry is based on the Standard Industrial Classification.[1] In the published Census reports, the amount of industry detail available varies directly with the size of the region; only very aggregated data are published for small regions, but the amount of industry detail increases progressively with the size of the region. The amount of industry detail is important for the location quotient, so that the level of published industry detail could place a constraint on the selection of the region.

5.4 THE LOCATION QUOTIENT

5.4.1 The Location Quotient as an Allocator

The location quotient is a measure of regional concentration in some variable relative to a benchmark level of concentration. In this case, the variable is employment by industry and the comparison is between the region's share of employment and the nation's share of employment in the same industry. Thus, if E_{ir} and E_{in} are regional and national employment in industry i, and E_{tr} and E_{tn} are total regional and national employment, the location quotient for industry i (LQ_i) is

$$LQ_i = \frac{E_{ir}}{E_{tr}} \Big/ \frac{E_{in}}{E_{tn}} .$$

If the location quotient is equal to 1, the region's share of employment in an industry just matches the nation's share. The latter can be taken as a measure of the

[1] The 1971 Census uses the 1970 Manual. See Statistics Canada, *Standard Industrial Classification Manual*, Cat. No. 12-501, December 1970.

employment required to supply the nation's consumption of the commodity produced by an industry. By extension, when the region's share equals the nation's share, the regional employment in that industry can be taken as the amount required to supply its consumption of the commodity. Hence regional industries with location quotients equal to 1 involve only non-basic employment.

If the location quotient is greater than 1, the region has a concentration of employment in that industry relative to the nation as a whole, and this implies regional specialization and exports. Basic employment would be represented by the amount over and above what is required to supply local needs. Finally, a location quotient of less than 1 implies that regional production is insufficient to supply local needs and that the commodity is imported. Any regional employment in such industries must be entirely non-basic.

Basic or export employment occurs in regional industries with location quotients greater than 1. The amount of basic employment in such industries (E_{Bir}) can be determined by subtracting the amount required to supply local needs from total regional employment, so that

$$E_{Bir} = E_{ir} - \frac{E_{in}}{E_{tn}} \cdot E_{tr} .$$

If this calculation is made for every regional industry with a location quotient greater than 1, and if the amounts are then summed for all industries, an estimate of regional basic employment is obtained. Non-basic employment for the region can then be determined by subtracting basic employment from total regional employment.

5.4.2 The Conceptual Problems of the Location Quotient[1]

Location quotients provide a relatively quick and cheap way to allocate regional employment between the basic and non-basic sectors. Unfortunately, the resulting estimates are prone to error because the allocations are based on a set of assumptions which are not likely to be met in practice.

The sources of error can best be explained by considering the three conditions required for location quotients to provide reliable estimates of a region's basic employment. First, the national economy must be a closed economy; that is, it cannot export or import commodities. National self-sufficiency is required so that the nation's share

[1]These problems are well-known and discussed in many sources. For a technical discussion see, Terry, Edwin F., "Linear Estimates of the Export Employment Multiplier", *Journal of Regional Science*, Vol. 6 (1965), No. 1, pp. 17-34. Other useful sources are Greytak, David, "A Statistical Analysis of Regional Export Estimating Techniques", *Journal of Regional Science*, Vol. 9 (1969), No. 3, pp. 387-395, and Tiebout, Charles M., *The Community Economic Base Study*, Supplementary Paper No. 16, Committee for Economic Development, New York, 1962, pp. 46-49. All three references provide statistical evidence on the reliability of the location quotient estimates.

of employment by industry is just sufficient to supply the national needs and also serve as a benchmark for the regional economy. Secondly, the region's consumption patterns must be identical to those of the nation as a whole. The region and the nation, then, must have the same average income per household, the same distribution of income among households, and the same set of tastes and preferences and relative prices for commodities, among other things. Thirdly, the average productivity of workers in each industry must be the same for the nation and the region to insure that the output per worker in each industry is identical at both levels.

How would the estimates be affected if the above conditions are not met? Suppose that the national economy is an open economy but that the nation and region are identical in all respects. In this case, the location quotient will overestimate the amount of employment required to supply regional consumption in those industries where the nation is an exporter and it will underestimate it in those industries where the nation is an importer. If the nation is a closed economy, with identical productivity levels among industries in the region and nation but with differing consumption patterns, then again the location quotient will generate faulty estimates. The region may now consume commodities in greater or smaller proportion than the nation as a whole, and non-basic employment will be underestimated in the first case and overestimated in the second. Finally, if all conditions are met except the third, the estimates will again be faulty. Non-basic employment will be overestimated in those industries where regional productivity exceeds national productivity and underestimated in those industries where regional productivity is less than national productivity.

It is apparent that location quotients will produce estimates that are subject to error if any of the three conditions are not met, and in practice, all three are not met to some degree or other. The error arises because the actual benchmarks do not correspond to the hypothetical ones. This can be remedied to some extent by selecting alternative benchmarks or by adjusting them so that they correspond more closely to the desired ones.

Alternative benchmarks are those obtained for areas other than for the nation as a whole, such as the province in which the region is located. If regional consumption and production patterns for a commodity are more like the province than the nation, a provincial benchmark may be a better allocator and lead to smaller errors.

The national benchmark or its alternative could also be adjusted to improve its reliability as an allocator. For example, adjustments could be made to take into account differences in productivity per worker between the region and the benchmark area. Other adjustments could be made for industries which are exporters or importers for the benchmark area so that the adjusted employment shares reflect the amounts required to supply internal demand more closely.

Selecting alternative benchmarks or adjusting the benchmarks will make them more reliable allocators. However, these procedures also increase the complexity of making the estimates because of the substantial amounts of information required on the consumption and production patterns in both the region under study and the benchmark area. The same information might be used more profitably to make allocations on the basis of informed judgments. They are simpler and may result in a

lower level of error than even the use of adjusted benchmarks. This is because the continued use of the location quotient to allocate employment will lead to two other sources of error, which, unlike those discussed previously, systematically operate to overestimate the size of the non-basic sector and thus underestimate basic employment.

The first of these is related to the level of industry aggregation used to make the estimates. In the location quotient, the benchmark is taken to represent the share of total employment required to supply the region's consumption of a commodity produced by an industry. This tacitly assumes that an industry produces a homogeneous commodity. Yet Census industries produce similar but not identical commodities, with the level of similarity diminishing as the level of industry aggregation increases. Since the commodities produced are similar but not identical, the comparison between the benchmark's and the region's share of employment may fail to uncover regional export employment, or if it does, it may understate it. Moreover, these problems will increase as the level of industry aggregation increases.

The problems arise because a regional industry may be specialized in certain commodities relative to the benchmark area. The consequence of this specialization can perhaps best be explained by the use of an example. Consider a region with only one type of manufacturing activity — a large biscuit manufacturing plant selling the bulk of its output in external markets. If a location quotient were calculated on the basis of highly aggregated industry data, such as all manufacturing, for example, the region's export employment would not show up because the comparison would involve all manufacturing employment in the benchmark area and not just biscuit manufacturing. At a lower level of aggregation, say, the Food and Beverage industries, the region's location quotient would be greater but likely still less than 1 because the comparison again involves a relatively large share of employment in the benchmark area. Only when less aggregated industry data are used, such as the three-digit Bakery Products industry or the four-digit Biscuit Manufacturers industry, would the region's specialization appear. But if the regional producer was specialized in only one type of biscuit production, a location quotient could understate the region's export employment, even at the four-digit level, since the benchmark would include the employment associated with all types of biscuit production and not just the specialized product.

The second source of error arises because location quotients produce a measure of net rather than gross export employment, and it is the gross measure that is required for the economic base model. This source of error will be present along with the previous source when estimates are made, although it is conceptually a separate source of error.

This problem can be explained most easily by considering a case where the industry data are disaggregated down to a very fine level of detail so that the industry produces a relatively homogeneous commodity. If a location quotient were calculated, all employment in excess of the amount required to satisfy local consumption would be classified as export employment. In this case, export employment could be understated if some regional consumption of the commodity were supplied by imports. Here, part of local production would be used to satisfy local consumption

and part would be exported. The location quotient would understate the amount of export employment by the difference between the amount required to satisfy local consumption, as measured by the benchmark, and the amount actually used to satisfy local consumption. This difference, measured by the amount of employment associated with the imports, represents the difference between the net exports measured by the location quotient and the gross exports required by the model.

The error due to the measurement of net rather than gross exports is present at every level of industry aggregation and not just at the finest level used in the explanation. The location quotient will always understate export employment because some of the regional output assumed to satisfy local demand will in fact be satisfied by imports. There is no satisfactory way to adjust for this problem other than to avoid it completely by using a full-fledged survey rather than location quotients. A more practical remedy, and one recommended later in this chapter, is to use location quotients as a guide to help uncover regional specialization, but to make the final allocations on the basis of other information.

A second remedy, that of using a modified form of the location quotient, has also been suggested. In the modified location quotient the benchmark is redefined to exclude the region as part of the comparison area. Thus the modified version of the location quotient becomes

$$LQ_i = \frac{E_{ir}}{E_{tr}} \Big/ \frac{E_{in} - E_{ir}}{E_{tn} - E_{tr}}$$

This version of the location quotient likely has merit by itself since the benchmark is now separated from the region, and the comparison stresses the difference between the region and the benchmark — that is, the region's uniqueness in relation to the benchmark area.[1]

The two location quotients will produce different values because the modified location quotient causes the values to be spread out relative to those for the standard location quotient. If the standard version is equal to 1, the modified version will also be equal to 1 since the numerator and the denominator of the modified benchmark are reduced in the same proportion. When the standard version is greater than 1, the value of the modified version will exceed that of the standard one. The numerator of the modified benchmark in this case will be reduced by proportionately more than the denominator. The opposite result will occur when the standard version is less than 1. Because of this, the modified location quotient will tend to produce larger measures of basic employment than the standard version. In practice, however, the two will produce very much the same result if the region is small relative to the benchmark, and this tends to be the typical case. Thus it really does not matter which version of the location quotient is used, unless the region is large in

[1]For a dissenting view see, Mattila, John M., and Thompson, Wilbur R., "The Measurement of the Economic Base of the Metropolitan Area", *Land Economics*, Vol. 31 (1958), pp. 218-219.

comparison to the benchmark; and then the more fundamental question of whether the economic base model can really be used for such a large region should be raised.

Before some comments are provided on the use of the location quotient, it would be useful to summarize what has been said so far.

1. The location quotient can provide a quick and cheap allocator.
2. The error level due to the assumptions embodied in the use of location quotients can be reduced by using alternative and adjusted benchmarks, but this increases the complexity of the calculations.
3. The type of information required to make adjustments to the benchmarks often makes allocations on the basis of informed judgment possible.
4. The use of informed judgment may be better because even if the alternative or adjusted benchmarks are used, the location quotient will still lead to errors which systematically underestimate basic employment.
5. These errors are caused by the level of industry aggregation used and the estimation of net rather than gross exports.
6. The errors caused by the level of industry aggregation can be reduced through the use of more disaggregated industry data, but the errors due to estimating net rather than gross exports remain.
7. The use of a modified version of the location quotient will provide little improvement in most relevant cases.

5.4.3 Application of the Location Quotient

The application of the location quotient would appear to be a relatively simple matter. The analyst must:

1. determine the form of the location quotient to be used — either the standard or modified version;
2. select the level of industry aggregation to be used from the Census;
3. determine the relevant comparison area or areas to serve as the benchmarks; and
4. make any necessary adjustments to the benchmarks.

The rest is a matter of making the calculations and evaluating the results.

Given the discussion in the previous section, it is suggested that the modified version of the location quotient be used, together with the finest level of industry data available from the Census. The selection of the relevant benchmarks poses a more difficult problem. Since the benchmark is supposed to represent an area which is similar to the region in consumption and production patterns, areas other than the rest of the nation may be relevant for many industries. The most logical selection criterion would seem to be the area over which the commodities produced by an industry are likely to trade because the trading or market area for the commodity would include both the area of production and consumption.

However, even though the trading area would seem to be the logical choice, its use creates serious problems in practice for three reasons. First, since industries and commodities are not the same, any trading area selected for an industry, even at the three- or four-digit level, may not be appropriate for all of the commodities produced by an industry. Second, even if industries and commodities were the same, the number of possible trading areas would be very large, ranging in size from the world market all the way down to the region itself. This creates obvious practical problems and suggests that a limited range of perhaps two or three areas should be selected, such as the nation, the province, and possibly the part of the province in which the region is located.

The third difficulty is the selection of the trading area for an industry. This can be handled in two ways: by an *a priori* assignment based on the nature of the commodities produced and their probable trading area, or by inferring the trading area from the values obtained for the location quotients.[1] In this latter method, the relevant trading area could be determined (in, say, a three-benchmark case) by calculating location quotients for each area. If the location quotients are greater than 1 for all three areas, it could be inferred that the trading area is the largest of the three, say, the nation. If only the two smaller areas have location quotients greater than 1, the trading area could be inferred to be the second-largest area, say, the province. If only the smallest area has a location quotient greater than 1, the trading area could be assumed to be the sub-area of the province. Finally, if the location quotients are less than 1 for all three areas, it could be inferred that the industry serves only the regional market.

The above procedure avoids the problem of judgmental errors when benchmarks are chosen on an *a priori* basis but it has defects of its own. It is obviously a more time consuming method. Moreover, it is not error-free since location quotients greater than 1 may simply reflect production and consumption pattern differences between the region and the benchmark areas. Therefore it is not foolproof or simple to use, and the recommended approach is an *a priori* assignment rather than market areas inferred from the location quotients. If the analyst wishes to infer the trading areas from the location quotients, he should be careful to follow the logical procedure described above. The analyst should also avoid the common error of selecting the benchmark from the alternative areas only on the basis of the highest obtained location quotient. This value is more likely to represent consumption and production pattern differences than the industry's actual trading area.

The fourth step in the application of the location quotients consists of the benchmark adjustments. As stated previously, however, this step is not recommended since it greatly adds to the complexity of making the estimates. Moreover the same information can be used to make informed judgments which are likely to produce better estimates than the ones obtained from the adjusted benchmarks.

[1]This approach is employed in one of the earliest (and still one of the best) published applications of the economic base model. See Hildebrand, George H., and Mace, Arthur, Jr., "The Employment Multiplier in an Expanding Industrial Market: Los Angeles County, 1940-47", *Review of Economics and Statistics*, Vol. XXXII (1950), pp. 241-249.

5.5 AN ALTERNATIVE APPROACH TO MEASUREMENT

The discussion of the location quotient indicated that there are a number of reasons for believing that it will produce unsatisfactory estimates. This leads to the obvious question of whether the estimates obtained with location quotients can be made more reliable. The answer is yes, but paradoxically by reducing the reliance on the location quotient as an allocator and by substituting informed judgment. If this is done, it may be possible to adjust for cases where the location quotient underestimates non-basic employment because of differences in the consumption and production patterns between the region and the benchmark area. More importantly, it may be possible to adjust for cases where the location quotient underestimates basic employment by estimating net rather than gross export employment. The overall effect would be a reduction in the level of error compared with a complete reliance on the mechanical allocator.

The use of informed judgment as an allocator is not an unusual suggestion. It is used frequently in economic base studies to adjust for the obvious errors produced by the indirect allocators, and its use rests on the common-sense argument that the analyst should be familiar with the region to be measured. The more direct information that is acquired about the region, the less reliance that need be placed on indirect allocators. Pushing the approach to its extreme would involve the complete abandonment of the use of indirect allocators, such as location quotients, and their replacement by data obtained directly from a regional survey.

The use of informed judgment, then, involves working in the area between the direct and indirect methods, with the selection dependent on the cost and effort of acquiring the information to make informed judgments as opposed to using location quotients. The cost and effort will not be large in many cases and the improvement in the estimates can be made relatively quickly and cheaply. This will tend to be true if the region is small and heavily specialized so that the basic and non-basic industries are relatively easy to identify. In other cases it will be much more difficult, and it becomes a matter of trying to judge how much the estimates would be improved if direct information is used rather than location quotients. In general, the larger the industry, the more worthwhile it will probably be to pursue it and the easier it will likely be to obtain the necessary information.

5.5.1 Guidelines to the Alternative Approach

The first step in using the alternative approach is to calculate location quotients at the finest level of industry detail available, with the use of appropriate benchmarks. This is a useful first step because it provides a guide to regional specialization relative to the benchmark area. Moreover, one of the merits of the location quotient is its ability to uncover not only the direct but also the indirect export industries, since the linked industries will also tend to have location quotients greater than 1.

The calculated location quotients will divide the region's industries into two groups: those where employment is non-basic (with location quotients of 1 or less) and those where employment is non-basic and basic (with location quotients greater

than 1). The next step is to re-assign the industries into three groups: those that are entirely non-basic, those that are entirely basic, and those that are "mixed". This can be done by employing informed judgments based on other information or by using the calculated location quotients when it is too difficult or expensive to make informed judgments.

In the following discussion each of the industry divisions in the Census will be examined to show how informed judgment can be used. While the discussion will be quite detailed, it should be noted that it cannot possibly cover all of the individual industries or all of the possible allocating problems that may arise in any given study. All that can be done is to suggest an approach that could be followed and to provide some guidelines that will be relevant to most cases. It would be useful for the reader to consult the *Standard Industrial Classification Manual* when the particular industries are discussed.

1. The Primary Industries (Agriculture, Forestry, Fishing and Trapping, and Mining)

The general presumption is that the primary industries are entirely basic except where it can be shown from other information that this is not the case. The appropriate benchmark for the location quotient is normally the rest of the nation. A location quotient greater than 1 is evidence that the regional primary industry has a comparative advantage in the production of the commodities relative to the rest of the nation. Since the commodities produced by the industry are competitive outside of the region, employment in the industry is not really dependent on local demand even if some of the output is consumed locally. Moreover, if the industry is competitive outside of the region, local demand is likely to be a trivial part of total demand. The argument implies that such industries should be allocated entirely to the basic sector.

If the location quotient is less than 1, the industry could still be entirely basic. This would be true if it is specialized in some of the commodities produced by the industry, if it is linked to other regional export industries, or if resident workers are engaged in the industry outside of the region. Therefore even if a primary industry has a location quotient of less than 1, it should not be assumed that it is non-basic unless this can be shown to be so from other evidence.

A non-basic primary industry is one that serves the regional market only because transportation costs provide a barrier that permits some local production to take place. Such industries exist in each of the primary industries and include activities such as fluid milk production for the local dairy industry, logging for the local sawmill, and sand and gravel pit operations for the local construction industry. Most non-basic primary industries are small, employing few members of the region's resident experienced labour force.

2. Manufacturing

The amount of non-basic manufacturing is related to the size of the region. In small regions most non-basic manufacturing will be found in a few Standard Indus-

trial Classification (S.I.C.) industries such as the Food and Beverage industries, the Printing, Publishing and Allied industries, the Wood industries and the Machine Shops industry. Larger regions can support more diversified non-basic manufacturing industries which can compete with imports even at a relatively small scale.

The appropriate benchmark for most manufacturing industries is the rest of the nation, since the commodities they produce tend to trade nationwide. For some manufacturing industries, however, the trading area is smaller than the nation so that the appropriate benchmark is the province or the part of the province in which the region is located. Included in this group are the industries mentioned above for the small regions and a few others such as concrete products which are expensive to transport.

Unlike the primary industries, there is no general presumption that the manufacturing industries are entirely basic, but there is a general presumption that the location quotients will understate export employment by measuring net rather than gross export employment. An industry with a location quotient greater than 1 is assumed to be a mixed industry with both a basic and non-basic component. It is possible, however, that the commodity produced by the industry is in fact a specialized commodity, none of which is sold locally. Local consumption in this case would be satisfied by imports and the regional industry would be entirely basic.

Such cases are not uncommon and it is worth the analyst's time to investigate industries which have location quotients greater than 1 and make up a large share of the experienced labour force in manufacturing. As an initial test it is useful to find out who the firms are and what they produce. Such information can often be readily obtained from published provincial directories of manufacturing or other published sources. It can also be obtained directly from the local Canada Employment office or from provincial and municipal officials. Simply knowing who the firms are and what commodities they produce is usually sufficient to determine whether an industry is entirely basic or not. Moreover, knowing what the commodities are is also useful in helping to identify linked industries. If the analyst suspects that the industry is not entirely basic, he might solicit additional information from the firms themselves. Even rough guesses as to where the firms' markets are will probably provide better allocators than those based on location quotients.

The same procedure could be followed for industries where the location quotient is less than 1 but where the industry has a large share of the experienced labour force in manufacturing. Again specialization may be present though the location quotient will not show it. In industries where the share of the experienced labour force is not large, location quotients can be used as allocators since any improvement in the estimates may not be worth the cost and effort of acquiring the information directly. But even in these cases, knowing who the firms are and what they produce will be helpful in making a decision. Such information may also help the analyst discover cases where the Census industries are not in fact present in the region and where resident employment takes place elsewhere.

3. Construction

Construction is the most difficult industry to handle in an economic base study. Technically, basic employment in this industry includes workers who are employed on projects geared to external demand and resident workers who are employed outside of the region. The Census data, of course, measure the experienced labour force, not employment, and refer to the place of residence, not the place of work. Therefore unless additional data sources are used, it is not possible to estimate either basic employment engaged in local production or resident employment outside of the region.

Given the resident experienced labour force data, the best the analyst can do is try to estimate the shares of externally and internally determined construction activity for the year in which the Census was taken. With the use of municipal building-permit data and provincial and federal government data sources on construction activity, it may be possible to produce some crude estimates, at least for government construction activity. Without such information, all that can be done is to use location quotients with subnational benchmarks. This tends to be the practice in many economic base studies.

4. Transportation, Communication and Other Utilities

Transportation and auxiliary services such as storage are concerned with the movement of commodities and people within the region (local transport), between the region and the rest of the province (intraprovincial transport), and between the region and the rest of the nation and the world (extraprovincial transport). A change in local demand will affect the demand for local transport, and (by means of a change in imports) the demand for intraprovincial and extraprovincial transport. Thus local employment in all three types of transport will be affected. A change in external demand will affect mainly intraprovincial and extraprovincial transport linked to the shipment of the export commodity. Any export employment in the case of local transport is related primarily to the tourist industry.

The initial problem is to allocate the various transport and related services to the three types of transportation. In general, the Rail, Air, Water, and Pipeline Transport industries, and the Storage industry, can be viewed as extraprovincial transport; the Other Truck Transport, the Bus Transport, Interurban and Rural, and the Highway and Bridge Maintenance industries as intraprovincial transport; and the Urban Transit Systems and Taxicab Operations industries as local transport.

Unless information on which to base informed judgments about tourism in the region is available, local transport should be allocated entirely to the non-basic sector. Intraprovincial and extraprovincial transport could be allocated on the basis of location quotients using subnational and national benchmarks respectively. Yet to do this could severely understate basic employment, especially for regions which are transportation centers. It is therefore desirable to make the allocations on the basis of other data if possible.

A few examples may be helpful to illustrate how this could be done. Suppose the region includes a port which is engaged primarily in serving other regions. It would be logical in this case to allocate all of the experienced labour force in water transportation to the basic sector since the activity is related primarily to external demand even if some local traffic moves through the port. The same argument, of course, would be valid for rail and air transportation centers. The region may not be a transportation center, but the transportation facilities it possesses may be specialized in their use. Thus its exports may be bulky and exported over long distances so that they move primarily by rail or water. However, its imports may come in by truck from a nearby distribution center. Rail or water transport in this case would be entirely basic while truck transport would be entirely non-basic. The type of information required to make such informed judgments may not be difficult to obtain, especially for small regions. The use of location quotients would seriously understate basic employment, while informed judgments would not.

The communication industries can be treated in a way similar to transport in that they can be broken down into extraprovincial, intraprovincial, and local. The extraprovincial category would include the Post Office and the Telegraph and Cable System industries, while the intraprovincial category would include the Telephone Systems industry. The Radio and Television Broadcasting industry should also be put into the intraprovincial category although in most cases it is likely to be entirely local. Location quotients can be used as allocators but if there is reason to believe that their use will seriously understate basic activity, additional information should be obtained to improve the allocations.

The utility industries are usually considered to be entirely non-basic, but it is possible for them to be linked to other export industries or even to be an export activity themselves. The Electric Power industry, for example, includes electric generation which is an export activity for some regions. If the industries have a basic component, it will likely show up in the location quotients. Industries with large location quotients may be worth investigating to see whether they represent export activities or simply differences in local demand patterns.

5. Trade

Basic employment can arise in wholesaling if the region serves as a distribution center (i.e., a break-bulk center) for other regions, and if this is true, it will also be a transportation center and its distribution and transportation functions will be tied together. Basic employment can also arise in wholesaling if the wholesale activity serves as an input supplier or an output distributor for a linked export industry. Such cases are found when the linked export industry consists of small firms unable to provide the services for themselves. In retailing, basic employment will occur if the region serves as a shopping center for other regions or if it has a tourist industry.

There is little reason to believe that location quotients will understate basic employment in trade by measuring net rather than gross exports, because buyers will tend to make use of nearby sources of supply if they are available. Of much greater concern is the possibility that the location quotients will overstate basic employment

because of differences in consumption and production patterns between the region and the benchmark area. A location quotient greater than 1 for a trade industry may reflect local specialization and export activity. It may also reflect differences between the region and the benchmark area in tastes and preferences, per capita incomes, family size, labour force participation rates, the ratio of labour to capital, and the level of excess capacity in the industry, among other things.

The selection of the appropriate benchmark area is clearly of some importance for the trade industries. Given that their trading area will involve a relatively small geographic area, a subnational benchmark such as the rest of the province may seem appropriate. If there are substantial differences between the region and the rest of the province in consumption and production patterns, subprovincial benchmarks may be even more appropriate. Also, if there are significant differences in family size or in labour force participation rates between the region and the benchmark area, some adjustment to the location quotient itself may be desirable. In this case, the ratio of the experienced labour force in the industry to, say, the population size of the region and the benchmark area may be a better form of location quotient.

All of this suggests that the location quotients for the trade industries should be used as a guide to the presence of regional specialization. When the location quotients are less than 1, the industry can be taken to be entirely non-basic. If they are greater than 1, the analyst should try to discover whether they reflect regional specialization or simply consumption and production pattern differences between the region and the benchmark. To help make such a judgment, the analyst could consult the *Census of Retail Trade*, the *Financial Post Survey of Markets* and other published references on trade. Personal interviews with regional officials would also be useful. On the basis of these sources of information, the industries could be taken as entirely non-basic or mixed, with the location quotient being used as the allocator for mixed cases. Some wholesale industries which are linked to other export industries may be an exception to this procedure. If such cases exist, it is possible that they are entirely basic.

6. Finance, Insurance and Real Estate

The Finance, Insurance and Real Estate industries provide services to both households and firms. Basic employment could arise through the sale of services — either directly to non-resident households and firms (including branches of the same firm) or indirectly to regional export industries.

The trading areas for industries in finance, insurance, and to some extent real estate vary dramatically, from the purely local market all the way up to the national and international market. In many of the industries, the firms tend to be national in scope, with national and regional administrative units and services provided by local branches or agents. In other industries, the firms and the functions they perform either are centralized at one or a few locations or are widely dispersed.

This diverse pattern of trading areas makes it difficult to select an appropriate benchmark for the location quotients. A national benchmark is not always appro-

priate even if the industry is national in scope since the services it offers may be produced and consumed locally for the most part. Most of the Census industry categories are in fact a mix of industries with very different trading areas. The national benchmark also may be inappropriate because the regional patterns of consumption differ markedly from the national pattern. This implies the use of a subnational benchmark, with a provincial benchmark likely a better compromise than a subprovincial one.

In most cases, the location quotients are not likely to understate export employment by measuring net rather than gross export employment because the services produced by the industries tend to be purchased locally if they are available, and imported if they are not. An exception could arise if the industry includes administrative employment associated with the head office operations of a regional firm. Such a case would probably be indicated by a location quotient much greater than 1, and could be investigated in more detail. Another problem caused by using the location quotients is that some specialized employment linked to a regional export industry may be hidden in the broader industry category. There is little that can really be done about this problem unless each and every industry is thoroughly investigated.

The general presumption for this industry division is that industries with location quotients of less than 1 are entirely non-basic while those greater than 1 are mixed. If an industry has a location quotient which is relatively large, however, and if it makes up a large share of the experienced labour force in the industry division, it should be investigated to determine whether it understates export employment. Such cases are likely to stem from the head office problem discussed previously.

7. Community, Business and Personal Service

The Community, Business and Personal Service industry division includes some industries which are entirely non-basic, others which could be mixed, and a few which could be entirely basic. When location quotients are calculated, the appropriate benchmark in nearly all cases will be subnational, with the rest of the province being a better choice than a subprovincial benchmark. Since the services produced by most of these industries are normally consumed where they are produced, export employment will result from non-resident consumption in the region. Also, since regional residents tend to make use of regional suppliers if they are available, there is little reason to assume that the location quotients will understate basic employment. Unfortunately, because of the diverse industries included in this division, there are exceptions to each of these statements.

The service industries are broken down into eight major industry groups. They are used as the basis for the following discussion, the purpose of which is to point out the industries that may fall into the three categories of entirely non-basic, mixed, and entirely basic and to make some other general comments about the industries in each group.

In the Education and Related Services group, the Kindergartens and Nursery Schools and the Elementary and Secondary Schools industries should be treated as

entirely non-basic. The other industries could be mixed, with the allocations based on the calculated location quotients using provincial benchmarks. In some cases, such as the Universities and Colleges industry, a national benchmark may be appropriate if the student body is likely to come from outside of the province. It is possible for education to be a major regional export industry and large location quotients deserve to be investigated to find out whether they really represent export activity and, if so, whether they understate it or not.

Export employment may arise in all Health and Welfare Services industries except possibly Welfare Organizations. The latter is normally viewed as being entirely non-basic but it too could have a basic component if external administration is involved. If the region serves as a medical center for other regions, there could be a large amount of basic employment in the Hospitals industry and it is useful to try to determine whether this is so.

The Religious Organizations industry is normally viewed as being entirely non-basic but it too could be basic if there is any external administration. The Amusement and Recreation Services industries could be mixed if the region has a tourist industry or if it is a shopping center for other regions. If the location quotients are greater than 1, the analyst should try to determine whether they reflect true export employment or simply regional consumption pattern differences. Some guidance could be obtained from the allocations for the region's retail trade industries. If they are mixed, it is not unreasonable for the Amusement and Recreation Services industries to be mixed as well.

The Services to Business Management industries could have an export component if they are linked to other regional export industries or if they sell services directly to non-residents. The Personal Service industries should normally be treated as being entirely non-basic. However, it is possible for them to have some basic employment linked to the tourist industry. The problem of determining whether a location quotient greater than 1 represents regional consumption pattern differences relative to the benchmark or the effect of tourist spending is normally a difficult one. The use of subprovincial rather than provincial benchmarks may help, but in most cases it is safer and more accurate simply to assume that they are entirely non-basic.

The Accommodation and Food Services industries cater to both residents and non-residents. The use of location quotients as allocators in this case is clearly unsatisfactory since the industries in the benchmark area are also in part export-related. Thus the analyst should avoid their use if possible. The most useful allocation would be on the basis of local tourist trade data, which may be available from studies undertaken by the region or the province. The best that can be done if such data are not available is to assume that the Hotels and Motels and the Camping Grounds and Trailer Parks industries are entirely basic. This will overstate basic employment but it will produce a better estimate than a location quotient. The other two industries — Lodging Houses and Residential Clubs, and Restaurants, Caterers and Taverns — can be allocated with location quotients. This will understate basic employment but it is probably closer to the mark than any other crude allocation since these industries do have a substantial non-basic component.

Miscellaneous Services, the final service industry group, is likely to be mixed for the most part, with basic employment linked to other export industries or related to direct sales to non-residents. One exception is Services to Buildings and Dwellings, which can be taken as entirely non-basic.

8. Public Administration and Defence

Public Administration and Defence includes the Federal, Provincial, and Local Administration industries. The Defence Services industry can be taken as entirely basic since employment is not related to local demand, and the Local Administration industry can be taken as entirely non-basic since employment is related entirely to local demand. The Federal Administration and the Provincial Administration industries are more troublesome. The simplest approach and one that is commonly used is to treat both of them as entirely basic because they are supported by external sources of funds. While this may be satisfactory from a short-run point of view, it is less satisfactory from a long-run point of view since some federal and provincial administration is related to local demand.

From the point of view of the region, federal administration can be divided into three types. The first depends both on the level of regional activity and on the size of the region in a long-run context and consists of the provision of government services that the region would have had to provide for itself in the absence of the federal government. As part of Canada, the region shares in the consumption of these federal government services and in the taxes required to pay for them. Since some federal administration is required at the local level to administer the region's share of these services and tax payments, it can be viewed as part of the region's non-basic sector.

A second type of federal administration depends on the type of export commodities produced by the region or on the fact that the region may serve as a regional federal administrative center. Federal administration is export-linked in this case or is a direct export (in the sense that the services flow in part to other regions), with the programs being funded by external sources. Such activity can be treated as part of the basic sector.

The third type of federal administration may be viewed in a political sense as inversely related to the level of local activity or directly related to the level of regional distress. This type of federal administration is also part of the region's basic sector and manifests itself as an injection of funds into the regional economy on the basis of an external political decision.

Of the three types of federal administration, only one can be considered as non-basic in a long-run context. The problem is to separate it from the other two so that federal activity in the region can be divided into its basic and non-basic components. This involves adjusting the benchmark to include only the federal administration related to the local administration of federal programs. Since most federal administration related to the administration of federal programs is in the Ottawa-Hull metropolitan area, the national benchmark could be defined to exclude this area as well as the region. An alternative and much more difficult approach is to try to determine

the nature of federal employment in the region directly and then allocate it according to the functions performed.

The argument used for federal administration is also applicable to provincial administration. An indirect approach can be used again to try to estimate the basic and non-basic components with a modified benchmark. In this case, the provincial benchmark would be modified to exclude the provincial capital as well as the region. The direct approach is again likely to be difficult unless the numbers involved are small.

9. Industry Unspecified or Undefined

The Industry Unspecified or Undefined industry division includes those members of the experienced labour force who either did not indicate their industry employment or did not define it in a manner to permit a definite industry allocation. A location quotient calculation for this case is clearly illogical. The best practice is simply to ignore this industry division in the estimates or, what amounts to the same thing, to allocate it between the two sectors in the same ratio as that for all other industries.

5.6 ESTIMATING THE COEFFICIENT h^m

The estimates obtained with location quotients and informed judgment produce only an approximation of the size of a region's basic and non-basic sectors. One reason for this is that the allocated data are for the experienced labour force and not employment. It is possible to adjust the estimates and convert them into employment estimates by using employment and unemployment data for the region's total experienced labour force from the published Census reports. Such data permit the calculation of an employment rate for the region's experienced labour force, which can be used to convert the experienced labour force estimates for the two sectors into employment estimates. If the analyst wants to adjust the industry estimates rather than the overall estimates, unpublished data will be required. While this adds to the cost and time of making the estimates, it does produce somewhat better results. An example will be provided in the next chapter to permit a comparison of the two types of adjustments.

The adjusted estimates of the basic and non-basic sectors now measure resident employment, but they include two different types — resident employment in the region and resident employment elsewhere. Since the Census data on the resident experienced labour force do not distinguish between the two types, resident employment in the region may be overstated, and as a consequence the region's non-basic sector may be overstated. Hence an adjustment should be made to remove any resident employment elsewhere that properly belongs in the region's basic sector.

When informed judgment is applied to the Census data, some resident employment elsewhere will be uncovered because the reported industry activity will not be represented in the region. The use of informed judgment thus permits some adjust-

ment for resident activity elsewhere. A more comprehensive adjustment is possible with a second set of Census data on the experienced labour force by place of work. By comparing the place of residence data with the place of work data, a crude estimate can be made of non-resident labour force activity elsewhere. However, the procedure is complicated and plagued with serious difficulties and it is not recommended in this Guide.

Apart from the use of informed judgment, little can really be done about the problem of resident activity elsewhere. As a result, the estimates may overstate the size of a region's non-basic sector. While the problem exists, it is not likely to be a serious one for most regions, especially if the region has been defined to minimize the amount of resident commuting to work in other regions.

The estimating procedure produces estimates of basic and non-basic employment and of unemployment for the region's resident experienced labour force. Since the unemployed would have been employed prior to the time of the Census, they are most likely to be supported by unemployment insurance payments — an external transfer from the region's point of view. Therefore the region's experienced unemployed should also logically be included as part of the basic sector. The coefficient h^m, required for the pure migrant labour multiplier, can now be estimated easily from the ratio of non-basic employment to the region's total experienced labour force.

The estimate of the coefficient h^m is based on one set of observations for non-basic employment and the region's total experienced labour force. This procedure is clearly less desirable than estimating the coefficient from time-series data and regression techniques. However, this is not possible for small regions since the only comprehensive data on them are the Census data and they are available only at ten-year intervals. If the coefficient is to be based on the current structure of the region, the most recent Census data should be used and this means that only one set of observations is available.

CHAPTER SIX

AN EXAMPLE OF ECONOMIC BASE MEASUREMENT

This chapter illustrates the use of the estimating procedure through an example project in an actual region. The selection of the region is considered first, and is designed to demonstrate how even a relatively straightforward choice may be constrained by the availability of data. The estimating procedure is set out next and consists of the calculation of location quotients and the use of informed judgment to obtain the final allocations. However, this is not the end of the procedure since the final allocations have to be adjusted for unemployment before the coefficient h^m can be obtained. The last section of the chapter explains how these adjustments are made.

6.1 THE EXAMPLE REGION

The example is a hypothetical project to be located in Cape Breton County, Nova Scotia. The project's direct labour supply area is expected to encompass the whole County. Moreover, since the County includes Sydney, Nova Scotia's second largest city, the direct labour income spending area is also expected to coincide with the direct labour supply area. The project's indirect suppliers are assumed to be scattered, with no significant ones located in the County or in areas adjacent to it. The multiplier study has a narrow purpose — to assess the project's impact on the employment opportunities in the area in which it is located. This precludes any consideration of the project's impact on other areas where significant input suppliers may be located.

The problem of selecting the desired region for the project would appear to be a relatively straightforward matter, with the obvious choice being the County itself. Since the County is also a Census division, published data are available for the experienced labour force by industry, but only at a very aggregated industry level. Such data, however, are not really suitable for the calculation of location quotients.

The Census population reference maps[1] show that Cape Breton County consists of three Census subdivisions — Grand Narrows-Sydney Mines, Big Pond-Sydney, and the Louisbourg Area. All of the first subdivision is included in the Sydney Mines agglomeration area and most of the second is included in the Sydney agglomeration area. Published data for the Census agglomeration areas are available at a much finer level of industry detail so that the two agglomeration areas might be used as an approximation of the County. Population data support such a choice given that the two agglomeration areas include about 97 percent of the County's population and all of its towns except Louisbourg. Thus for all practical purposes, the two agglomeration areas can be taken as equivalent to the County.

[1]Statistics Canada, *1971 Census of Canada, Population, Reference Maps*, Vol. 1, Part 1, Bulletin 1.1-12, Cat. No. 92-712.

6.2 MEASURING THE BASIC AND NON-BASIC SECTORS

Once the region has been selected, the required data on the experienced labour force by industry and by place of residence can be obtained from the Census. Column 1 of Table 6-1 shows the combined data for the two agglomeration areas by industry division, by major industry group within each industry division, and by three-digit S.I.C. industries within each industry group.[1] The three-digit industries along with similar data for the benchmark areas were used for the location quotients. Only two benchmark areas were employed, one for Canada and one for Nova Scotia. Benchmarks smaller than Nova Scotia were not thought desirable because the region made up a large share (about 14 percent) of the Province's total experienced labour force.

The calculations involved the modified form of the location quotients as discussed in Section 5.4.2 and the benchmarks for each industry as suggested in the Guidelines in Section 5.5.1. Accordingly, adjusted benchmark areas were used for the Federal Administration and the Provincial Administration industries, with the one for Canada excluding the Ottawa-Hull Census Metropolitan area and the one for Nova Scotia excluding the Halifax Census metropolitan area. A location quotient was not calculated for Local Administration since this industry was taken to be entirely non-basic.

The calculated location quotients shown in column 2 (Canada benchmarks) and column 3 (Nova Scotia benchmarks) of Table 6-1 are the first step towards discovering regional specialization. They show the obvious industries that should be investigated before the final allocations are made. The final allocations were based on informed judgments made from other information (if the cost and effort of obtaining such information were reasonable) or on the calculated location quotients.

Column 4 of the table shows how the final allocations were made. Allocations made on the basis of the calculated location quotients are shown by the symbol L.Q. Other allocations involved:

1. Special assignments (A),
2. Assignments to the basic sector because no regional production was discovered (B),
3. Assignments to the basic sector because of the specialized nature of the industry (C),
4. Assignments to the non-basic sector because the output of the industry was assumed to be consumed entirely in the region (D), or
5. Assignments with the use of adjusted location quotients (A.L.Q.).

The results of this procedure were estimates of the region's basic sector experienced labour force by industry shown in column 5. The non-basic sector experienced labour force, in column 6, was obtained as a residual for each major industry group and industry division, because the random rounding employed in the 1971

[1]In the 1971 Census, the last digit of each observation was randomly rounded to either zero or five. This proved to be somewhat troublesome when published data on the two agglomeration areas were summed by industry. It was even more troublesome when attempts were made to check the calculations since the individual industry data rarely summed to the major group or industry division totals.

Census prevented the separate allocations from summing to the industry group and division totals. While Census rounding is an inconvenience, the procedure used to balance the two sectors with the totals is not likely to produce a distortion in the overall size of the two sectors. Now that the data in the Table have been described, the procedure used to make the final allocations can be considered in more detail.

6.3 ALLOCATION BY INFORMED JUDGMENT

Both published sources and telephone interviews were used to obtain the information to make informed judgments. Three provincial government publications were the most important sources of published information: the *County Surveys*,[1] the *Community Surveys*,[2] and the *Nova Scotia Directory of Manufacturing*.[3] Other sources of published information were also used, as will be explained below. The published information was supplemented by information obtained from telephone interviews with officials of the provincial and municipal governments, the federal government Manpower Centers, and the regional office of the Department of Regional Economic Expansion. Most of the information collected was for 1971, the year of the Census data, although in some cases it referred to years close to 1971. The information used and the judgments made are discussed by industry division beginning on page 80.

[1]Nova Scotia, Economics and Development Division, Department of Trade and Industry, *County Surveys, 1970*, Halifax, N.S.

[2]Nova Scotia, Economics and Development Division, Department of Trade and Industry, *Community Surveys, 1970*, Halifax, N.S.

[3]Nova Scotia, Department of Trade and Industry, *Nova Scotia Directory of Manufacturing, 1968-69*, and *1970-71*, Halifax, N.S., and Nova Scotia, Department of Development, *Nova Scotia Directory of Manufacturers, 1972-73*, Halifax, N.S.

Table 6-1
Initial and Final Allocating Procedures and the Estimates of the Size of the Basic and Non-Basic Sectors, Cape Breton County, 1971

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
AGRICULTURE	270	0.123	—	A	19	251
Farms	260	—	—	—	—	
Services Incidental to Agriculture (021)	10	—	—	—	—	
FORESTRY	125	0.372	—	A	125	—
Logging (031)	110	—	—	—	—	
Forestry Services (039)	15	—	—	—	—	
FISHING AND TRAPPING	205	—	—	—	205	—
Fishing (041)	200	1.931	—	C	200	
Fishery Services (045)	5	0.500	—	C	5	
MINES (INCLUDING MILLING), QUARRIES AND OIL WELLS	4 190	—	—	—	4 190	—
Metal Mines	30	—	—	—	30	—
Miscellaneous Metal Mines (059)	30	0.115	—	B	30	
Mineral Fuels	4 100	—	—	—	4 100	—
Coal Mines (061)	4 095	190.833	—	C	4 095	
Crude Petroleum and Natural Gas Industry (064)	5	0.040	—	B	5	
Non-Metal Mines (except coal mines)	40	—	—	—	40	—
Asbestos Mines (071)	10	0.300	—	B	10	
Miscellaneous Non-Metal Mines (079)	30	0.800	—	C	30	
Quarries and Sand Pits	25	—	—	—	25	—
Stone Quarries (083)	25	—	3.500	C	25	

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
MANUFACTURING	6 530	—	—	—	5 275	1 255
Food and Beverages	1 405	—	—	—	907	498
Meat and Poultry Products Industries (101)	55	—	0.682	L.Q.	—	
Fish Products Industry (102)	760	5.730	—	C	760	
Fruit and Vegetable Processing Industries (103)	25	—	0.241	L.Q.	—	
Dairy Products Industry (104)	200	—	1.120	L.Q.	21	
Flour and Breakfast Cereal Products Industry (105)	10	—	1.500	L.Q.	3	
Feed Industry (106)	5	—	0.091	L.Q.	—	
Bakery Products Industries (107)	225	—	1.575	L.Q.	87	
Miscellaneous Food Industries (108)	30	—	0.170	L.Q.	—	
Beverage Industries (109)	100	—	0.800	A.L.Q.	36	
Rubber and Plastics Products Industries	20	—	—	—	20	—
Rubber Products Industries (162)	5	0.032	—	B	5	
Plastic Fabricating Industry, n.e.s. (165)	15	0.154	—	B	15	
Leather Industries	5	—	—	—	—	5
Luggage, Handbag and Small Leather Goods Manufacturers (179)	5	0.143	—	L.Q.	—	
Textile Industries	10	—	—	—	5	5
Carpet, Mat and Rug Industry (186)	5	0.143	—	L.Q.	—	
Automobile Fabric Accessories Industry (188)	5	0.250	—	B	5	
Knitting Mills	5	—	—	—	—	5
Hosiery Mills (231)	5	0.143	—	L.Q.	—	
Wood Industries	65	—	—	—	—	65
Sawmills, Planing Mills and Shingle Mills (251)	45	0.167	—	L.Q.	—	

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
Sash, Door and Other Millwork Plants (254)	15	0.222	—	L.Q.	—	
Miscellaneous Wood Industries (259)	15	0.500	—	L.Q.	—	
Furniture and Fixture Industries	15	—	—	—	—	15
Household Furniture Manufacturers (261)	15	0.114	—	L.Q.	—	—
Paper and Allied Products	40	—	—	—	40	—
Pulp and Paper Mills (271)	35	0.093	—	B	35	
Paper Box and Bag Manufacturers (273)	5	0.034	—	B	5	
Printing, Publishing and Allied Industries	300	—	—	—	54	246
Commercial Printing (286)	65	—	1.200	L.Q.	11	
Publishing and Printing (289)	230	—	1.231	L.Q.	43	
Primary Metal Industries	3 095	—	—	—	3 055	40
Iron and Steel Mills (291)	3 055	12.746	—	C	3 055	
Iron Foundries (294)	5	0.071	—	L.Q.	—	
Smelting and Refining and Aluminum Rolling (295 + 296)	15	0.087	—	L.Q.	—	
Metal Rolling, Casting and Extruding, n.e.s. (298)	20	1.000	—	L.Q.	—	
Metal Fabricating Industries (except Machinery and Transportation Equipment Industries)	235	—	—	—	18	217
Fabricated Structural Metal Industry (302)	5	0.050	—	L.Q.	—	
Ornamental and Architectural Metal Industry (303)	70	1.250	—	L.Q.	14	
Metal Stamping, Pressing and Coating Industry (304)	105	0.806	—	L.Q.	—	
Wire and Wire Products Manufacturers (305)	10	0.167	—	L.Q.	—	
Hardware, Tool and Cutlery Manufacturers (306)	5	0.050	—	L.Q.	—	

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
Machine Shops (308)	50	—	1.077	L.Q.	4	
Machinery Industries (except Electrical Machinery)	20	—	—	—	—	20
Miscellaneous Machinery and Equipment Manufacturers (315)	5	0.016	—	L.Q.	—	
Office and Store Machinery Manufacturers (318)	15	0.222	—	L.Q.	—	
Transportation Equipment Industries	165	—	—	—	155	10
Motor Vehicle and Parts Manufacturers (323 + 325)	50	0.123	—	C	50	
Truck Body and Trailer Manufacturers (324)	5	—	0.500	L.Q.	—	
Railroad Rolling Stock Industry (326)	5	0.090	—	L.Q.	—	
Shipbuilding and Repair (328)	105	1.706	—	C	105	
Electrical Products Industries	700	—	—	—	690	10
Manufacturers of Small Electric Appliances (331)	5	0.100	—	L.Q.	—	
Manufacturers of Major Appliances (Electric and Non-Electric) (332)	5	0.077	—	B	5	
Manufacturers of Household Radio and Television Receivers (334)	5	0.111	—	L.Q.	—	
Communications Equipment Manufacturers (335)	680	3.276	—	C	680	
Manufacturers of Electrical Industrial Equipment (336)	5	0.036	—	B	15	
Non-Metallic Mineral Products Industries	120	—	—	—	74	46
Stone Products Manufacturers (353)	15	—	1.333	L.Q.	4	
Concrete Products Manufacturers (354)	25	—	0.875	L.Q.	—	
Ready-Mix Concrete Manufacturers (355)	10	—	0.375	L.Q.	—	
Glass and Glass Products Manufacturers (356)	5	0.056	—	B	5	

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
Abrasives Manufacturers (357)	65	4.500	—	C	65	
Miscellaneous Non-Metallic Mineral Products Industries (359)	5	—	0.035	L.Q.	—	
Petroleum and Coal Products Industries	50	—	—	—	42	8
Petroleum Refineries (365)	35	0.417	—	B	35	
Miscellaneous Petroleum and Coal Industries (369)	10	3.000	—	L.Q.	7	
Chemical and Chemical Products Industries	265	—	—	—	215	50
Manufacturers of Plastic and Synthetic Resins (373)	5	0.166	—	L.Q.	—	
Manufacturers of Pharmaceuticals and Medicines (374)	5	0.056	—	L.Q.	—	
Paint and Varnish Manufacturers (375)	20	0.600	—	L.Q.	—	
Manufacturers of Soap and Cleaning Compounds (376)	5	0.143	—	L.Q.	—	
Manufacturers of Toilet Preparations (377)	5	0.143	—	L.Q.	—	
Manufacturers of Industrial Chemicals (378)	215	2.143	—	C	215	
Miscellaneous Chemical Industries (379)	15	0.189	—	L.Q.	—	
Miscellaneous Manufacturing Industries	20	—	—	—	—	15
Scientific and Professional Equipment Industries (391)	10	0.115	—	L.Q.	—	
Miscellaneous Manufacturing Industries, n.e.s. (399)	5	0.040	—	L.Q.	—	
CONSTRUCTION	2 485	—	—	—	—	2 485
General Contractors	1 355	—	—	—	—	1 355

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
Building Construction (404)	840	—	0.996	L.Q.	—	
Highway, Bridge and Street Construction (406)	370	—	0.805	L.Q.	—	
Other Construction (409)	145	—	0.774	L.Q.	—	
Special-Trade Contractors (421)	1 140	—	0.778	L.Q.	—	1 140
TRANSPORTATION, COMMUNICATION AND OTHER UTILITIES	3 730	—	—	—	1 195	2 535
Transportation	2 580	—	—	—	1 070	1 510
Air Transport (501)	70	0.541	—	L.Q.	—	
Services Incidental to Air Transport (502)	30	1.333	—	L.Q.	8	
Railway Transport (503)	985	1.978	—	L.Q.	487	
Water Transport (504)	515	4.500	—	C	515	
Services Incidental to Water Transport (505)	25	0.389	—	C	25	
Moving and Storage, Used Goods, Uncrated (506)	10	—	0.188	L.Q.	—	
Other Truck Transport (507)	375	—	0.882	L.Q.	—	
Bus Transport, Interurban and Rural (508)	70	—	2.000	L.Q.	35	
Urban Transit Systems (509)	40	—	1.000	D	—	
Taxicab Operations (512)	240	—	1.675	D	—	
Highway and Bridge Maintenance (516)	195	—	0.591	L.Q.	—	
Miscellaneous Services Incidental to Transport (517)	10	—	0.375	L.Q.	—	
Storage	40	—	—	—	22	18
Other Storage and Warehousing (527)	40	—	2.200	L.Q.	22	
Communication	690	—	—	—	68	622
Radio and Television Broadcasting (543)	105	—	0.806	L.Q.	—	
Telephone Systems (544)	235	—	0.606	L.Q.	—	

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
Telegraph and Cable (545)	40	1.375	—	L.Q.	11	
Post Office (548)	310	1.225	—	L.Q.	57	
Electric Power, Gas and Water Utilities	425	—	—	—	35	390
Electric Power (572)	335	—	1.000	L.Q.	—	
Water Systems (576)	45	—	2.167	L.Q.	24	
Other Utilities (579)	35	—	1.429	L.Q.	11	
TRADE	6 020	—	—	—	890	5 130
Wholesale Trade	1 260	—	—	—	176	1 084
Wholesalers of Coal and Coke (606)	20	—	12.869	L.Q.	16	
Wholesalers of Petroleum Products (608)	185	—	0.945	L.Q.	—	
Wholesalers of Paper and Paper Products (611)	25	—	1.167	L.Q.	4	
Wholesalers of General Merchandise (612)	10	—	1.500	L.Q.	3	
Wholesalers of Food (614)	410	—	1.386	L.Q.	114	
Wholesalers of Tobacco Products (615)	5	—	0.200	L.Q.	—	
Wholesalers of Drugs and Toilet Preparations (616)	5	—	0.077	L.Q.	—	
Wholesalers of Household Furniture and Furnishings (618)	25	—	1.000	L.Q.	—	
Wholesalers of Motor Vehicles and Accessories (619)	90	—	1.042	L.Q.	4	
Wholesalers of Electrical Machinery, Equipment and Supplies (621)	30	—	0.364	L.Q.	—	
Wholesalers of Machinery and Equipment, n.e.s. (623)	75	—	0.344	L.Q.	—	

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
Wholesalers of Hardware, Plumbing and Heating Equipment (624)	80	—	0.815	L.Q.	—	
Wholesalers of Metal and Metal Products, n.e.s. (625)	5	—	0.333	L.Q.	—	
Wholesalers of Lumber and Building Materials (626)	220	—	1.192	L.Q.	35	
Wholesalers of Scrap and Waste Materials (627)	20	—	0.750	L.Q.	—	
Wholesalers, n.e.s. (629)	75	—	0.568	L.Q.	—	
Retail Trade	4 760	—	—	—	714	4 046
Food Stores (631)	1 405	—	1.477	L.Q.	454	
General Merchandise Stores (642)	1 035	—	0.970	L.Q.	—	
Tire, Battery and Accessories Stores (652)	115	—	1.143	L.Q.	14	
Gasoline Service Stations (654)	380	—	0.955	L.Q.	—	
Motor Vehicle Dealers (656)	320	—	0.802	L.Q.	—	
Motor Vehicle Repair Shops (658)	185	—	1.061	L.Q.	11	
Shoe Stores (663)	60	—	1.308	L.Q.	14	
Men's Clothing Stores (665)	70	—	1.333	L.Q.	17	
Women's Clothing Stores (667)	195	—	1.833	L.Q.	89	
Clothing and Dry Goods Stores, n.e.s. (669)	130	—	1.200	L.Q.	22	
Hardware Stores (673)	55	—	0.833	L.Q.	—	
Household Furniture and Appliance Stores (676)	245	—	1.478	L.Q.	79	
Radio, Television and Electrical Appliance Repair Shops (678)	30	—	1.000	L.Q.	—	
Drug Stores (681)	195	—	0.948	L.Q.	—	
Book and Stationery Stores (691)	15	—	0.333	L.Q.	—	

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
Florists Shops (692)	25	—	0.538	L.Q.	—	
Jewellery Stores (694)	70	—	1.111	L.Q.	7	
Liquor, Wine and Beer Stores (696)	90	—	1.087	L.Q.	7	
Retail Stores, n.e.s. (699)	125	—	0.686	L.Q.	—	
FINANCE, INSURANCE AND REAL ESTATE	840	—	—	—	7	833
Finance Industries	520	—	—	—	7	513
Banks and other Deposit Accepting Establishments (701)	375	—	0.700	L.Q.	—	
Other Credit Agencies (703)	95	—	0.964	L.Q.	—	
Security Brokers and Dealers (including Exchanges) (705)	30	—	1.333	L.Q.	7	
Investment and Holding Companies (707)	15	—	0.500	L.Q.	—	
Insurance Carriers (721)	150	—	0.600	L.Q.	—	150
Insurance Agencies and Real Estate Industry	170	—	—	—	—	170
Insurance and Real Estate Agencies (735)	135	—	0.704	L.Q.	—	
Real Estate Operators (737)	35	—	0.323	L.Q.	—	
COMMUNITY, BUSINESS AND PERSONAL SERVICE INDUSTRIES	8 790	—	—	—	1 087	7 703
Education and Related Services	2 405	—	—	—	161	2 244
Kindergarten and Nursery Schools (801)	5	—	0.200	D	—	
Elementary and Secondary Schools (802)	1 980	—	1.043	D	—	
Schools of Art and Performing Arts (803)	5	—	0.571	L.Q.	—	
Vocational Centers, Trade Schools and Business Colleges (804)	150	4.667	—	L.Q.	118	
Post-Secondary, Non-University Institutions (805)	85	—	2.000	L.Q.	43	

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
University and Colleges (806)	105	0.234	—	L.Q.	—	
Libraries, Museums and Other Repositories (807)	70	—	1.111	D	—	
Education and Related Services, n.e.s. (809)	5	—	0.333	L.Q.	—	
Health and Welfare Services	2 905	—	—	—	583	2 322
Hospitals (821)	2 195	—	1.315	L.Q.	526	
Related Health Care Institutions (822)	45	—	0.650	L.Q.	—	
Offices of Physicians and Surgeons (823)	195	—	1.122	L.Q.	21	
Offices of Para-medical Personnel (Practitioners) (824)	40	—	1.833	L.Q.	18	
Offices of Dentists (825)	50	—	1.273	L.Q.	11	
Diagnostic and Therapeutic Services, n.e.s. (826)	10	—	0.273	L.Q.	—	
Miscellaneous Health Services (827)	20	—	1.500	L.Q.	7	
Welfare Organizations (828)	350	—	1.210	D	—	
Religious Organizations (831)	310	—	1.381	D	—	310
Amusement and Recreation Services	295	—	—	—	78	217
Motion Picture Theatres (841)	70	—	1.429	L.Q.	21	
Motion Picture Production and Distribution (842)	5	—	0.500	L.Q.	—	
Bowling Alleys and Billiard Parlours (843)	45	—	1.625	L.Q.	17	
Golf Clubs and Country Clubs (844)	35	—	1.250	L.Q.	11	
Theatrical and Other Staged Entertainment Services (845)	10	—	0.333	L.Q.	—	
Miscellaneous Amusement and Recreation Services (849)	130	—	1.286	L.Q.	29	
Services to Business Management	315	—	—	—	—	315

(Table 6-1 continued on next page)

Table 6-1 (continued)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
Employment Agencies and Personal Suppliers (851)	30	—	0.800	L.Q.	—	
Security and Investigation Services (855)	50	—	0.516	L.Q.	—	
Offices of Accountants (861)	50	—	0.519	L.Q.	—	
Offices of Architects (863)	5	—	0.125	L.Q.	—	
Engineering and Scientific Services (864)	55	—	0.385	L.Q.	—	
Offices of Lawyers and Notaries (866)	65	—	0.486	L.Q.	—	
Offices of Management and Business Consultants (867)	5	—	0.333	L.Q.	—	
Miscellaneous Services to Business Management (869)	45	—	0.520	L.Q.	—	
Personal Services	1 040	—	—	—	32	1 008
Shoe Repair Shops (871)	35	—	5.000	D	—	
Barber and Beauty Shops (872)	260	—	1.141	L.Q.	32	
Private Households (873)	430	—	0.976	D	—	
Laundries, Cleaners and Pressers (except Self-Service) (874)	190	—	1.325	D	—	
Self-Service Laundries and Dry Cleaners (876)	15	—	1.333	D	—	
Funeral Services (877)	70	—	1.538	D	—	
Miscellaneous Personal Services (879)	35	—	0.769	D	—	
Accommodation and Food Services	1 130	—	—	—	230	900
Hotels and Motels (881)	230	—	0.557	A	230	
Lodging Houses and Residential Clubs (883)	55	—	0.600	L.Q.	—	
Camping Grounds and Trailer Parks (884)	5	—	0.166	L.Q.	—	
Restaurants, Caterers and Taverns (886)	845	—	0.979	L.Q.	—	

(Table 6-1 concluded on next page)

Table 6-1 (concluded)

INDUSTRY	Resident Experienced Labour Force	Initial Allocation Location Quotients		Final Allocation (Code)	Sector Allocation	
		Canada	Nova Scotia		Basic	Non-Basic
Miscellaneous Services	405	—	—	—	3	402
Labour Organizations and Trade Associations (891)	70	—	1.250	D	—	
Photographic Services, n.e.s. (893)	15	—	0.500	L.Q.	—	
Automobile and Truck Rental (894)	10	—	0.750	L.Q.	—	
Machinery and Equipment Rental (895)	10	—	0.333	L.Q.	—	
Blacksmithing and Welding Shops (896)	20	—	1.200	L.Q.	3	
Miscellaneous Repair Shops (897)	20	—	0.857	L.Q.	—	
Services to Buildings and Dwellings (898)	145	—	1.000	D	—	
Miscellaneous Services, n.e.s. (899)	125	—	0.854	L.Q.	—	
PUBLIC ADMINISTRATION AND DEFENCE	2 595	—	—	—	961	1 634
Federal Administration	1 630	—	—	—	961	669
Defence Services (902)	910	1.443	—	C	910	
Other Federal Administration (909)	720	1.076	—	A.L.Q.	51	
Provincial Administration (931)	445	—	0.814	A.L.Q.	—	445
Local Administration (951)	520	—	—	D	—	520
Sub-total	35 770	—	—	—	13 954	21 816
INDUSTRY UNSPECIFIED OR UNDEFINED	3 160	—	—	A	1 233	1 927
Total Industries	38 930	—	—	—	15 187	23 743

Source: Statistics Canada, *1971 Census of Canada*, Vol. III, Part 4, Bulletin 3.4-6, Cat. No. 94-743.

Codes:
A. Special Assignment (see text).
B. Assigned to basic sector because no local production found in region.
C. Assigned to basic sector because of specialized nature of production.
D. Assigned to non-basic sector because all of industry's output consumed in region.
L.Q. Location quotient allocation.
A.L.Q. Adjusted location quotient allocation.

1. Agriculture

The general presumption is that the primary industries are entirely basic, but this did not appear to be true of Cape Breton County agriculture. The County's agricultural industry employed a very small share of its experienced labour force — only 0.69 percent as compared with 2.48 percent for Nova Scotia and 5.58 percent for Canada. Data in the *County Surveys, 1970* showed only 117 commercial farms in the County in 1966, with most of these being either dairy farms (67 percent) or poultry farms (15 percent).

Given the small size of the region's agricultural sector and its heavy concentration in dairy farms, it seemed likely that Cape Breton agriculture was tied primarily to local demand. If any basic activity existed, it was probably linked to the export of dairy products. Thus the experienced labour force in agriculture was divided between dairy farming and other agriculture on the basis of the dairy farms' share of commercial farms. The resident experienced labour force in dairy farming was then allocated between the basic and non-basic sectors on the basis of the location quotient for the Dairy Products industry in manufacturing.

2. Forestry

The County's forestry industry was also of minor importance, accounting for only 0.35 percent of the experienced labour force. Data in the *County Surveys, 1970* showed that most of the industry's output consisted of pulpwood, pit props and mine packs. Since there was no pulp and paper industry, pulpwood was a direct County export. The output of pit props and mine packs was tied to the County's mining industry and was an indirect County export. A small amount of the industry's output consisted of lumber but given that the export activities dominated, it was decided that the forestry industry was not really tied to local demand even if some of the industry's output might be consumed locally. Thus all of the experienced labour force in the forestry industry was allocated to the basic sector.

3. Fishing and Trapping

The large location quotient recorded for the County's fishing industry is not surprising given that Cape Breton County and the Atlantic Provinces as a whole are important exporters of fish products. Since the region has a comparative advantage in the production of fish, the industry is not really dependent on local demand even though some of its output is consumed locally. Thus all of its experienced labour force was allocated to the basic sector. It should also be noted that the location quotient in this case would be unreliable as an allocator because a large share of Canada's employment in the industry is linked to export markets.

4. Mining

The *County Surveys, 1970* and the *Directory of Manufacturing, 1968-69* list coal, dolomite, limestone and fire clay as the mining products of the County. All of these were either direct or indirect exports linked to the County's steel industry; thus the experienced labour force in these industries was assigned to the basic sector. The other mining industries shown in the Census (Asbestos, Miscellaneous Metal Mines and Petroleum and Natural Gas) did not exist in the County and were assumed to have occupied the region's experienced labour force elsewhere. Therefore all labour force activity in these industries was also allocated to the basic sector.

5. Manufacturing

The manufacturing industry accounted for the second-largest share (18.26 percent) of the region's experienced labour force. Since published sources and telephone interviews indicated that most of this labour force was engaged in the production of specialized products for markets outside of the County, it was allocated entirely to the basic sector. The industries, the likely firms[1] and their products included:

1. Iron and Steel Mills — the Sydney Steel Corporation (blooms, ingots, rails, basic iron, reinforcing bars and steel bars),
2. Motor Vehicles and Parts — Canadian Motor Industries Ltd. (automobile assembly),
3. Communications Equipment — General Instruments of Canada Ltd. (automotive radio tuners and coils),
4. Abrasives — Prominerals Ltd. (crude ore, fused aluminous oxide and grains, zirconia-added), and
5. Industrial Chemicals — Canadian Liquid Air Ltd. (acetylene, nitrogen, oxygen and compressed air), and Kaiser Strontium Products Ltd. (sodium sulphate, strontium carbonate and strontium nitrate).

In addition to these five industries, two others were also allocated entirely to the basic sector: Fish Products, because its markets were primarily outside of the region, and Shipbuilding and Repair, because it was found to be linked to the fishing industry and to the ferry service to Newfoundland.

Information obtained from the *County Surveys, 1970*, the *Community Surveys, 1970*, the *Directory of Manufacturing, 1970-71*, the *Directory of Manufacturers, 1972-73*, the local telephone directory and telephone interviews disclosed some Census manufacturing industries that were not present in the region. It was assumed that any resident activity in these industries occurred outside of the region and they were also allocated entirely to the region's basic sector. Other information permitted resident activity in the Beverage industry to be allocated through the use of an adjusted location quotient. This industry was found to consist almost entirely of carbonated beverage production and a location quotient for Nova Scotia was calculated on the

[1]Many of these firms no longer exist in the County.

basis of employment in the Carbonated Beverage industry, as estimated from data in the *County Surveys, 1970* and *Community Surveys, 1970*. The remaining industries were then allocated on the basis of the calculated location quotients either because the other information collected did not permit any other basis for allocation or because the cost of acquiring additional information did not warrant the expected improvement in the estimates.

6. Construction

Construction is the most difficult industry to allocate in an economic base study and this was clearly true for Cape Breton County. Information obtained from telephone interviews indicated that resident labour force activity in the region in 1971 was probably much less than that reported by the Census. The Census data therefore included some basic sector resident construction activity elsewhere. It was also probable that some resident labour force activity in the region was related to basic sector production. However, it was difficult to obtain any hard data on which to base a reasonable estimate of basic sector activity. As a result, a conservative approach had to be taken, that of using location quotients with subnational benchmarks. The final allocation included no basic sector activity, which is clearly an understatement. Given the size of the construction industry (about 7 percent of the experienced labour force), this understatement is likely to produce a downward bias in the size of the basic sector.

7. Transportation, Communication and Other Utilities

Location quotients with the benchmarks suggested in the Guidelines were used to allocate most of the industries in this division. The water transport industries were an exception; they were allocated entirely to the basic sector because they were found to be related to the ferry service to Newfoundland (a direct export) and to the region's commodity exports of coal, steel, and pulpwood (an indirect export). The Urban Transit and Taxicab Operations industries were another exception and were assumed to be entirely non-basic even though some of their activity is no doubt related to the local tourist industry. However, there was no meaningful way of separating tourist-related activity from purely local activity.

8. Trade

a. Wholesale Trade

The calculated location quotients showed some wholesale and retail industries with location quotients greater than 1, which indicated the presence of basic sector activity. This regional concentration relative to the benchmark area appeared to be due to the region's role as a distribution and retail center for nearby counties on Cape Breton Island and to the ferry service to Newfoundland.

Sydney, the second largest city in Nova Scotia, had the largest share of both the County's retail and wholesale sales. In 1971 Sydney accounted for about 26 percent of the County's population but it had about 47 percent of its retail sales[1] and about 54 percent of its wholesale sales[2]. With the two surrounding counties of Richmond and Victoria included, Sydney had about 22 percent of the area's population and about 42 percent of its retail and 50 percent[3] of its wholesale sales. While the data to some extent reflect the likely higher per capita incomes in Sydney (as compared with the rest of Cape Breton County and the other two counties), they also provide support for Sydney's and hence the region's role as a wholesale distribution center for adjoining counties. Moreover, since some general cargo also moves through the region's ports to Newfoundland,[4] some basic wholesaling activity appears to be supported by the export of wholesaling services to other provinces. On the basis of this evidence it was concluded that location quotients likely reflect the existence of basic activity rather than consumption or production pattern differences with the benchmark area, and they were therefore used to make the final allocations.

b. Retail Trade

The previous discussion argued for the County's (and especially its major city's) role as a service center for adjoining counties. The calculated location quotients for retail trade also appeared to support this role. Relative concentration, in comparison with the benchmark area, appeared in the type of retail activities that tend to characterize a regional shopping center, such as clothing, shoes, household furniture and appliances, jewellery, and food.

The data in Table 6-2 provide additional support for the argument by comparing per capita retail sales by the six major retail groups for the four Cape Breton Island counties, for Halifax County and for Nova Scotia as a whole. When compared with the two adjoining counties, Cape Breton's per capita retail sales are nearly double those of Richmond and about 50 percent greater than Victoria's, provided that Victoria County's extraordinary automotive group sales are ignored. Moreover, Cape Breton's large location quotient for food retailing seems to be supported by the data, with per capita sales much larger than those for the adjoining counties and above those for Halifax County and Nova Scotia as a whole.

Since the data in Table 6-2 appear to support the calculated location quotients, they probably reflect regional specialization rather than consumption or production pattern differences with the benchmark area. Thus they were again used to allocate activity in this major industry group between two sectors.

[1]Statistics Canada, *1971 Census of Canada, Retail Trade*, Vol. VII, Parts 2 and 3, Cat. No. 97-702 and 97-703.
[2]Statistics Canada, *1971 Census of Canada, Wholesale Trade*, Vol. VIII, Part 3, Cat. No. 97-723.
[3]This is an estimate since data on wholesale sales for Victoria County were not published in the Census.
[4]*County Surveys* and *Community Surveys, op. cit.*

Table 6-2
Per Capita Retail Sales by Retail Group for
Nova Scotia and Selected Counties, 1971

Retail Group	Nova Scotia	Halifax County	Cape Breton County	Richmond County	Victoria County	Inverness County
				(dollars)		
Food	355	380	401	263	235	272
General Merchandise	243	247	264	132	260	368
Automotive	412	452	295	156	812	313
Apparel and Accessories	81	114	89	116	—	51
Hardware and Home Furnishings	68	63	55		—	41
Other Retail Stores	209	257	175		153	293
Total	1 369	1 514	1 277	668	1 459	1 463

Source: Statistics Canada, *1971 Census of Canada, Retail Trade Business Location Statistics, Counties or Census Divisions, Cities and Towns*, Vol. VII, Part 3, Cat. No. 97-703.

9. Finance, Insurance and Real Estate

The calculated location quotients did not indicate the presence of any basic activity apart from the Security Brokers and Dealers industry. Other information obtained from published sources and direct interviews seemed to support the location quotients by indicating that the industries were geared primarily to serving the region's population. Again, the Security Brokers and Dealers industry, which appeared to provide services to adjoining counties, was the one exception. The location quotients were therefore used to make the final allocations.

10. Community, Business and Personal Service

Subnational benchmarks were used to calculate location quotients for most of the industries in this division, and most of the final allocations were based on the calculated location quotients. The primary concern with the calculated location quotients for the service industries is not that they may understate basic sector activity but that they may overstate it because of consumption or production pattern differences between the region and the benchmark area. Location quotients greater than 1, therefore, had to be investigated to confirm that they really represented regional specialization. Each of the major industry groups will be considered separately to show how this was done.

a. Education and Related Services

In the final allocations, all activity in the Kindergarten and Nursery Schools and the Elementary and Secondary Schools industries was allocated to the non-basic sector since it was assumed to be related entirely to local demand. The Libraries, Museums and Other Repositories industry was also allocated to the non-basic sector on the basis of a judgment about the nature of industry activity in the region. The other industries were allocated through the use of the calculated location quotients but only two had location quotients greater than 1. Basic activity in the Vocational Centers, Trade Schools and Business Colleges industry appeared to be related to the federal government manpower retraining programs, which are designed to retrain workers and help them migrate from the region. Basic activity in the Post-Secondary, Non-University Institutions industry was related to the Nova Scotia Eastern Institute of Technology, one of two such institutions in the Province in 1971. Since some basic activity appeared to be present in both industries, the use of the calculated location quotient seemed warranted.

b. Health and Welfare Services

The calculated location quotients for the health services industries indicated that the region may serve as a regional health center, and other information confirmed this. *The Canadian Hospital Directory*[1] listed nine hospitals in Cape Breton County,

[1]Canadian Hospital Association, *Canadian Hospital Directory*, Toronto, Ontario, 1972.

two of which were specialized — the Cape Breton Hospital (a mental hospital) and the Point Edward Hospital (a hospital for tuberculosis and other chest diseases). The other hospitals appeared to be general institutions providing services not only to the residents of the County but also to other counties on Cape Breton Island. Since location quotients for the hospitals and the other health services industries appeared to be consistent with the County's role as a regional health center, they were used for the final allocations.

The remaining industry, Welfare Organizations, also had a location quotient greater than 1 but no evidence could be found to support the presence of basic activity. All activity was therefore assumed to be related to the region and the industry was allocated entirely to the non-basic sector.

c. Religious Organizations

The Religious Organizations industry also had a location quotient greater than 1 but this was taken as evidence of a consumption pattern difference between the region and the benchmark area. All activity, therefore, was allocated to the region's non-basic sector.

d. Amusement and Recreation Services

Basic activity in the Amusement and Recreation Services industries could occur if the region serves as a regional shopping center and if it has a tourist industry. Both of these possibilities were true for Cape Breton County. Location quotients greater than 1 for some industries in this group seemed reasonable and were taken as evidence of the existence of basic activity. The small size of the experienced labour force attached to the industries did not justify further investigation so that the calculated location quotients were used to make the final allocations.

e. Services to Business Management

The Services to Business Management industries could have a basic component if they are linked to other regional export industries as suppliers of services or if they sell services directly to the residents of other regions. Both alternatives were likely to be true for some of the industries in this group although the calculated location quotients were all less than 1. Given the small size of the industries, further investigation did not seem warranted since any improvement in the overall estimates would likely be small in relation to the time and effort that would have to be expended. Hence the calculated location quotients were used to make the final allocations.

f. Personal Services

The Personal Services industries should normally be treated as entirely non-basic because they are related primarily to local demand. This practice was followed in the final allocation for all industries except the Barber and Beauty Shop industry, which tends to be complementary to the existence of a regional shopping center, and a location quotient was used to allocate its activity. It should also be noted that many

of the industries in this group had location quotients greater than 1 and many of these are difficult to explain. Of particular interest is the Shoe Repair industry's location quotient of 5.0, a very high value.

g. Accommodation and Food Services

The final allocations for the Accommodation and Food Services industries followed the suggestions in the Guidelines. The Hotels and Motels industry was allocated entirely to the basic sector since its services are consumed primarily by non-residents. The other industries were allocated on the basis of calculated location quotients even though it was recognized that they probably understated basic activity.

h. Miscellaneous Services

All of the industries in this major group were allocated through the use of the calculated location quotients except for the Labour Organizations and Trade Associations and the Services to Buildings and Dwellings industries. Other information indicated that the former was entirely dependent on local activity while the latter is by definition geared to serving local needs. Both of these industries were therefore assigned to the non-basic sector.

11. Public Administration and Defence

Public Administration and Defence caused little difficulty in the allocations. Defence Services was allocated entirely to the basic sector because its services are not related to local demand. The Federal Administration and Provincial Administration industries were allocated on the basis of the adjusted location quotients discussed in the Guidelines. Finally, the Local Administration industry was taken to be entirely non-basic, as explained in the Guidelines.

12. Industry Unspecified or Undefined

The last division, Industry Unspecified or Undefined, was allocated between the two sectors on the basis of the overall basic to non-basic ratio obtained for all the other industry divisions. This again follows the procedure recommended in the Guidelines.

6.4 ADJUSTMENTS TO THE ALLOCATIONS

6.4.1 The Need to Adjust the Estimates

The estimating procedure described in the previous section will understate the size of a region's basic sector for two reasons. First, resident experienced labour force members working outside the region have not been included except for the cases discovered through informed judgment. Second, the data used are for the experienced

labour force and not employment. Since some of the unemployed may be supported by unemployment insurance or other external transfers, they should also be included in the basic sector. The estimates in column 5 of Table 6-1 can then be viewed as lower-bound estimates rather than final estimates of the basic sector.

The discussion in Chapter Five showed that apart from the use of informed judgment, little can really be done about the problem of resident activity elsewhere. Thus the analyst will have to accept the fact that the size of the basic sector may be biased downward. It is possible, however, to adjust for unemployment in one of two ways. The first is a quick but crude adjustment to the overall size of the two sectors with published Census data while the second uses unpublished data from a special Census tabulation to adjust the industry estimates. The following discussion shows how both types of adjustments can be made.

The adjustments and all of the subsequent discussion will be illustrated with data for Cape Breton County rather than Sydney – Sydney Mines. The two agglomeration areas have been used as an approximation of the County up to this point to take advantage of the more detailed industry data available in the published Census reports. The subsequent discussion, however, does not require as much industry detail, but it does require the type of published and unpublished data that tend to be most readily available at the Census division rather than the agglomeration area level.

The use of the County as the example region means that estimates of the size of the basic and non-basic experienced labour force will be needed for this area. These can be obtained relatively quickly and with a high degree of confidence on the basis of the shares of basic and non-basic activity for Sydney – Sydney Mines, since the latter account for about 97 percent of the experienced labour force for the County. The estimates for the County and the corresponding data for the two agglomeration areas are shown in Table 6-3 (pages 90-91) at about the level of industry detail given in the published Census reports for Census divisions.[1] This table will form the primary reference for the subsequent discussion.

6.4.2 The Adjustment for Basic Sector Unemployment

The adjustment for basic sector unemployment can be made at two levels. The overall estimates can be adjusted relatively quickly with published Census data on the total resident experienced labour force broken down into the employed and the unemployed.[2] The employed can then be divided into the basic and non-basic

[1]The industry detail in the table is in fact somewhat greater than in the published Census reports because a comparison of the published data for Sydney – Sydney Mines and Cape Breton County permitted some additional industry groups to be uncovered. Hence all industry groups are shown for Transportation, Communication and Other Utilities and for Community, Business and Personal Service rather than the partial breakdown provided in the Census.

[2]Statistics Canada, *1971 Census of Canada, Labour Force and Individual Income*, Vol. III, Part 1, Bulletin 3.1-4, Cat. No. 703.

employed by using the shares of basic and non-basic activity obtained through location quotients and informed judgment. The unemployed are then added to the basic employed to obtain an overall estimate of the basic sector. This produces the following estimates for Cape Breton County:

Resident experienced labour force			40 235
Non-basic sector employment		22 307	
Basic sector		17 928	
Basic employment	14 408		
Basic unemployment	3 520		

The result is an adjusted non-basic to basic ratio of 1.24 to 1. The estimate for the coefficient h^m obtained from the ratio of non-basic employment to the total experienced labour force is then 0.55 when rounded to two decimals.

Adjusting the industry data requires a special Census tabulation but consists of much the same procedure. The level of industry detail used in the adjustment is a question to be determined by the analyst. In general, the more detailed the industry data, the less likely it is for basic and non-basic employment to be understated because of variations in the share of unemployment among industries. Moving to a greater level of industry detail, however, will increase the cost of obtaining the data and may increase the waiting time. If the analyst is willing to incur these to obtain very detailed data, it is possible to avoid the adjustment altogether by making the initial estimates directly with employment data. This can be done if similar data are obtained for all of the benchmark areas — national, provincial, and subprovincial.

Table 6-3
Estimates of the Size of the Basic and Non-Basic Sectors for Sydney - Sydney Mines and Cape Breton County, 1971

Industry	Sydney - Sydney Mines			Cape Breton County		
	Experienced Labour Force	Basic Sector	Non-Basic Sector	Experienced Labour Force	Basic Sector	Non-Basic Sector
Agriculture	270	19	251	275	19	256
Forestry	125	125	—	160	160	—
Fishing and Trapping	205	205	—	310	310	—
Mining (including Milling), Quarries and Oil Wells	4 190	4 190	—	4 210	4 210	—
Manufacturing	6 530	5 275	1 255	6 950	5 558	1 392
Food and Beverages	1 405	907	498	1 765	1 139	626
Other Manufacturing	5 125	4 368	757	5 185	4 419	766
Construction	2 485	—	2 485	2 575	—	2 575
Transportation, Communication and Other Utilities	3 730	1 195	2 535	3 810	1 214	2 596
Transportation and Storage	2 620	1 092	1 528	2 660	1 108	1 552
Communication	690	68	622	715	70	645
Electric Power, Gas and Water	425	35	390	440	36	404
Trade	6 020	890	5 130	6 135	907	5 228
Wholesale Trade	1 260	176	1 084	1 275	178	1 097
Retail Trade	4 760	714	4 046	4 860	729	4 131
Finance, Insurance and Real Estate	840	7	833	855	7	848
Community, Business and Personal Service	8 790	1 087	7 703	8 920	1 100	7 820
Education and Related	2 405	161	2 244	2 465	165	2 300
Health and Welfare	2 905	583	2 322	2 925	587	2 338
Religious Organizations	310	—	310	310	—	310
Amusement and Recreation	295	78	217	295	78	217

(Table 6-3 concluded on next page)

Table 6-3 (concluded)

Industry	Sydney - Sydney Mines			Cape Breton County		
	Experienced Labour Force	Basic Sector	Non-Basic Sector	Experienced Labour Force	Basic Sector	Non-Basic Sector
Services to Business Management	315	—	315	315	—	315
Personal Services	1 040	32	1 008	1 060	33	1 027
Accommodation and Food	1 130	230	900	1 150	234	916
Miscellaneous Services	405	3	402	405	3	402
Public Administration and Defence	2 595	961	1 634	2 800	1 037	1 763
Sub-total	35 770	13 954	21 816	37 005	14 522	22 483
Industry Unspecified or Undefined	3 160	1 233	1 927	3 230	1 267	1 963
Total	38 930	15 187	23 743	40 235	15 789	24 446

Source: Statistics Canada, *1971 Census of Canada*, Vol III, Part 4, Bulletin 3.4-4, Cat. No. 94-741, and Table 6-1.

Table 6-4 shows the industry adjustments on the basis of a special Census tabulation by major industry division for Cape Breton County. The first two columns provide data on the resident experienced labour force by major industry division broken down into the employed and unemployed. Column 3 shows the percentage of the basic sector resident experienced labour force for each industry division from Table 6-3. These percentages are then used to adjust the employment data to obtain estimates of basic resident employment in column 4. Column 5 is simply the sum of basic resident employment and resident experienced unemployment. The overall result is a non-basic to base ratio of 1.22 and a value for the coefficient h^m equal to the previous value of 0.55 when rounded to two decimals.

Both adjustments represent an attempt to estimate basic employment from the average share of basic activity obtained from the resident experienced labour force data. This procedure produces only an approximation of basic employment because of the variation in the share of unemployment among industries that is covered up by industry aggregation. As a result, the adjustment is less satisfactory for the overall estimates than it is for the industry divisions and it is less satisfactory for the industry divisions than if more detailed industry data were used. The variation in the share of unemployment among industries also explains the difference in the results between the two levels of adjustments. Since the difference was small, however, it did not affect the size of the rounded coefficient h^m in the examples.

The assignment of the resident experienced unemployed to the basic sector has been justified on the grounds that they may be supported by external transfers. Since they were employed at some point during the year and a half prior to the Census, many would be eligible for unemployment insurance. The assignment, however, will in fact overstate the number in this situation because some will be supported by internal not external transfers, and are technically part of the non-basic sector. Also, some may not be living in the region at all, even if they claim to be residents of the region in the Census.

The inclusion of all of the resident experienced unemployed as part of the basic sector implies an overstatement of basic sector unemployment, but it is not possible to judge by how much. Offsetting this to some extent is the understatement of basic employment because resident employment elsewhere has not been fully taken into account. This would imply that the adjusted basic sector estimates are better overall, although again it is difficult to say by how much.

Table 6-4
Estimates of Basic Employment and the Adjusted Basic Sector for Cape Breton County

Industry	Resident Experienced Labour Force		(3) Basic Sector (Percent)	(4) Basic Resident Employment (3) × (2)	(5) Adjusted Basic Sector (1) + (4)
	(1) Unemployed	(2) Employed			
Agriculture	20	255	6.9	18	38
Forestry	20	140	100.0	140	160
Fishing and Trapping	5	305	100.0	305	310
Mines (including Milling), Quarries and Oil Wells	115	4 095	100.0	4 095	4 210
Manufacturing	685	6 270	80.0	5 016	5 701
Construction	665	1 910	—	—	665
Transportation, Communication and Other Utilities	305	3 510	31.9	1 120	1 425
Trade	580	5 550	14.8	821	1 401
Finance, Insurance and Real Estate	50	805	0.8	6	56
Community, Business and Personal Service	510	8 410	12.3	1 034	1 544
Public Administration and Defence	200	2 605	37.0	964	1 164
Industry Unspecified or Undefined	365	2 860	39.2	1 121	1 486
Total	3 520	36 715		14 640	18 160

Source: Special Census tabulation and Table 6-3.

CHAPTER SEVEN

HOW TO ESTIMATE THE PROJECT EMPLOYMENT MULTIPLIERS

The two previous chapters showed how the coefficient h^m could be estimated. This chapter explains how to estimate the coefficient h^1 and again illustrates the procedure with data for the example region. The values of these two coefficients are then used at the end of the chapter to derive a set of project employment multipliers.

7.1 HOW TO ESTIMATE THE COEFFICIENT h^1

7.1.1 The Coefficient and Regional Per Capita Income

The previously estimated coefficient h^m (in the long-run version of the economic base model) is an average value that measures the change in non-basic employment when new basic and non-basic jobs are filled by migrant labour. Regional income and population both grow when migrant labour is employed but regional per capita income and the pattern of non-basic spending and employment remain the same. Therefore the non-basic sector can be viewed as being replicated in proportion to the change in regional employment.

In the short-run version of the model, on the other hand, the coefficient h^1 is a marginal value that measures the response of non-basic employment when local labour fills the new basic and non-basic jobs. Although the region's income grows, its population remains unchanged so that non-basic employment changes only because of the increased per capita income. Since population is unchanged, regional residents are likely to consume the same amount of many of the non-basic commodities they consumed before; but because they are now richer than before, they are also likely to increase their consumption of other non-basic commodities. As a result, the pattern of non-basic spending and employment will change, with some non-basic activities expanding and others remaining constant. Therefore, unlike the long-run version of the model, the whole non-basic sector does not replicate itself when regional employment grows.

The coefficient h^1, then, is concerned with the change in income-sensitive non-basic employment as a result of a change in total regional employment. Such a coefficient is best estimated from time-series data on non-basic and total regional employment. Unfortunately, time-series data are not available for the example region nor are they likely to be available for any small region. An alternative but less satisfactory approach is to estimate the coefficient from the data already obtained on non-basic and total regional activity. This can be done by separating the estimate of non-basic employment into two parts — the part that is likely to be sensitive to changes in per capita income (income-related employment) and the part that is likely to be sensitive to the size of the region's existing population (population-related employment).

If N_{ep} is the population-related part of non-basic employment and N_{ey} the income-related part, then

$$N_e = N_{ep} + N_{ey} .$$

If both sides are divided by Y_e, then

$$\frac{N_e}{Y_e} = \frac{N_{ep}}{Y_e} + \frac{N_{ey}}{Y_e} \text{ , so that}$$

$$h^m = h^{mp} + h^{my},$$

where h^{mp} is the part of the coefficient h^m that remains unchanged when regional income changes and h^{my} is the part that will change. Here, h^{my} can be taken as an approximation of h^1.

It should be noted that h^{my} is simply a share of the average coefficient h^m, so that it too is an average and not a marginal value. Moreover, defining h^{my} as equivalent to h^1 means that when Y_e changes, N_{ey} will change in proportion to it and cause all non-basic activity in that part of the non-basic sector to be replicated. Since this is unlikely, h^{my} will tend to understate the expansion in some non-basic activities and overstate it in others. The problem, however, is not unique to this model but arises in any model that attempts to forecast with coefficients embodying fixed proportions, such as the input-output model.

7.1.2 The Approach to Estimation

Dividing non-basic employment into its two parts can be approached by considering the nature of the commodities produced by the non-basic industries. Some of these commodities are related primarily to the size of the region's population, and an expansion in regional per capita income will lead to little or no change in the industries' output or employment. Included in this group are industries that produce commodities with a low income elasticity of demand, such as food, as well as those that produce non-market commodities geared primarily to the size of the region's population, such as elementary and secondary education and government administration. Other industries, in contrast, produce commodities with a high income elasticity of demand and output and employment in these industries will grow as regional per capita income grows. Among these are the producers of consumer durables, high fashion clothing, jewellery, and consumer services such as entertainment and travel.

While it may be possible to allocate some of the commodities produced by the non-basic industries to the two categories on the basis of the primary influence, many commodities will in fact be influenced by both the size of the region's population and its per capita income. Thus, for example, the output of electricity is in part related to the size of the region since output will grow as population grows; but it is also related to the region's per capita income because many of the commodities using

electricity have high income elasticities of demand. Three categories of non-basic industries might therefore be more appropriate to help divide non-basic employment. These include non-basic industries producing commodities that are

1. primarily population-related (P),
2. primarily income-related (Y), or
3. related to both influences (B).

Measures of income or, more accurately, expenditure elasticity could be used to allocate the industries to the three categories. Table 7-1 provides such measures for selected commodities on the basis of data on household expenditure patterns found in Statistics Canada, *Urban Family Expenditure 1976* (Cat. No. 62-547). While these measures are helpful, they really provide only a rough guide to allocating the industries. One reason is that the S.I.C. industries used by the Census produce similar but not identical commodities, with the degree of similarity declining as the level of industry aggregation increases. The measures of expenditure elasticity, therefore, will only approximate the expenditure elasticities faced by the Census industries and the approximation will become poorer as the level of industry aggregation grows.

A second and more important reason is that the expenditure elasticities only provide a guide to the industries where the initial impact of the change in household income and expenditures will be felt. These are the industries that wholly or partly produce the final consumer commodities to which the expenditure elasticities refer, and the expenditure elasticities in Table 7-1 are classified by such industries. The change in household expenditures, however, will also affect other industries that supply inputs to the industries producing the final consumer commodities. And while many of these inputs are likely to be imported in most regions, some will be produced locally and will come from other regional industries and from the same industries where the initial impact will be felt. Non-basic employment will therefore change in industries other than those associated with the measures of expenditure elasticity and the change may be greater in the industries producing final consumer commodities than the measures would suggest.

Table 7-1
Household Expenditure Elasticities for Selected Commodities Classified by the S.I.C. Industry Where an Expenditure Change Is Likely to Have Its Initial Effect

Industry and Commodity	Expenditure Elasticity
Construction	
Rent	−1.00
Repairs and maintenance, owned quarters	+1.23
Interest on mortgages	+2.95
Transportation, Communication and Other Utilities	
Transportation	
Air travel	+1.66
Local and commuting, street car, bus and train	+0.27
Taxi (including tips)	−0.50
Communication	
Rental of cablevision	+0.55
Postage	+0.72
Telephone, basic charge	−0.08
Telephone, long-distance charges	+1.08
Electric Power, Gas and Water Utilities	
Electricity	+0.38
Piped gas	+0.52
Water	+0.29
Trade	
Retail Trade	
Food prepared at home	+0.22
Household cleaning supplies	+0.19
Paper supplies, food wraps, etc.	+0.30
Automobile and truck purchase	+2.81
Automobile and truck operation	+1.71
Clothing	+1.30
Footwear	+1.07
Floor covering	+1.41
Furniture	+1.57
Major household appliances	+1.29
Small electrical appliances	+1.00
Recreational appliances (audio-visual)	+1.38
Toilet preparations	+0.75
Reading	+0.80
Jewellery	+2.15
Beer, liquor and wine purchased from stores	+1.05
Other vehicle purchase and operation	+4.04
Finance, Insurance and Real Estate	
Bank charges	+1.70
Interest on personal loans	+2.56

(Table 7-1 concluded on next page)

Table 7-1 (concluded)

Industry and Commodity	Expenditure Elasticity
Interest on mortgages	+2.95
Automobile insurance premiums	+1.49
Home insurance premiums	+1.17
Life insurance premiums	+2.00
Private health insurance premiums	+1.93
Community, Business and Personal Service	
Health and Welfare	
Dental care	+1.43
Amusement and Recreational Services	
Admission to events	+1.68
Personal Services	
Personal care services	+1.00
Domestic help (except child care)	+2.94
Laundry and cleaning sent out	+1.39
Laundry and dry cleaning, self-service	−0.64
Accommodation and Food Services	
Food consumed at eating places, except travel	+2.06
Beer, liquor and wine consumed on licensed premises	+1.90

Source: The expenditure elasticities were obtained from a linear regression analysis of the log of per capita household expenditures (excluding direct taxes) against the log of per capita household expenditures on a commodity. The data used were budget data from Statistics Canada, *Urban Family Expenditure 1976* (Cat. No. 62-547), and are for families of two or more persons (Table 24). The results of the regression analysis are available from the Project Assessment and Evaluation Branch, Department of Regional Economic Expansion, Ottawa.

These two difficulties, along with the fact that some non-basic industries produce non-market commodities which cannot be allocated with expenditure elasticities, mean that such measures cannot serve as the sole criterion for allocating non-basic employment. The allocations will also require the analyst's judgment. The nature of the region's non-basic industries discovered through location quotients and informed judgment will provide information on the types of commodities they produce. The measures of expenditure elasticity, or judgments about the likely expenditure elasticities if no measures are available, can then be used to allocate the industries to the three categories discussed previously if predominant commodities are apparent. For many industries, especially very aggregated ones, no predominant commodities will be apparent and the most reasonable approach will be to assume that both per capita income and the region's population size will influence non-basic employment. Allocating industries in this way means that many of them may end up being assigned to the third category. This is not necessarily unsatisfactory since the overall result may be a reasonable estimate of the desired coefficient. However, it does indicate the type of problem the analyst often faces at the small-region level because of a lack of data.

7.2 GUIDELINES ON THE ALLOCATION OF NON-BASIC EMPLOYMENT

A set of guidelines are provided in this section as an aid to allocating non-basic employment by industry to the three categories discussed previously — primarily population-related (P), primarily income-related (Y), and related to both influences (B).

Employment data by major industry division, such as those shown in Table 6-4, can usually be obtained relatively quickly from the Census. If unpublished data are obtained this will be the level of industry detail available in most cases. In the allocation of non-basic employment, more disaggregated industry data are often preferred to avoid allocating most industries (and especially the service industries) to the third category. Industry data at the major industry group level are usually satisfactory for most regions, and this is the level that will be used in the guidelines and in the example of allocation provided in the next section. Employment data by major industry group can usually be estimated by applying the employment rate for each industry division from the unpublished data[1] to the estimates of the non-basic experienced labour force by industry obtained from the published data. This is the approach that will be taken in the example in the next section.

The comments offered below are intended to provide a general guide to the allocation of non-basic employment. The actual allocations, however, will depend on the nature of the non-basic industries in the region. Thus, the guidelines should be viewed as an approach to allocation rather than a specific set of recommendations that apply to all regions.

1. Agriculture, Fishing and Trapping

Any non-basic employment in these industries will be related to the production of food products for regional consumption. Since food has a low expenditure elasticity of demand, non-basic employment can be taken as primarily population-related.

2. Forestry, Mining and Construction

Non-basic employment in forestry and mining is usually related to the production of direct or indirect inputs for the region's construction industry and thus the three industries can be considered together.

Non-basic construction consists of the production of additional capacity and the repair and alteration of existing capacity in the region's non-basic industries and housing. If per capita income grows, some non-basic industries will expand and may require additional capacity and additional alteration and repair. Also, the growth of per capita income may cause households to demand additional capacity in owner-occupied housing and additional alteration and repair to their existing housing. Therefore, in contrast to what was said in the earlier discussion of the short-run model,

[1]See Table 6-4 for employment data by industry division.

some additional construction activity may in fact be induced by a growth in regional per capita income. A good deal of regional construction activity, however, is also related to the region's population size. Thus both influences are present, although population size is probably more important than per capita income. What is true for construction will also be true for its supplying industries (forestry and mining).

3. Manufacturing

The manufacturing industries can be conveniently divided into the Food and Beverage industries and the other manufacturing industries. The Food and Beverage industries produce commodities which have a low expenditure elasticity of demand, and any non-basic employment can be viewed as primarily population-related. For other manufacturing, the allocation depends on the commodities produced by the dominant regional industries in the group. In most cases, there will be no dominant industries but rather a mix of industries with very difference expenditure elasticities of demand. The most sensible approach, therefore, is simply to assume that non-basic employment is affected by both influences.

4. Transportation, Communication and Other Utilities

a. Transportation and Storage

Non-basic employment in transportation (and auxiliary services such as storage) is related to the movement of non-basic goods and regional residents within the region and to imported goods and travel services into the region. Some of the transported goods will have a high expenditure elasticity of demand and an increase in regional per capita income will lead to an expansion of non-basic transportation and storage. Others will have a low expenditure elasticity and little if any expansion will occur when regional per capita income grows. The same mixed pattern is probable for the people-moving transportation industries, with local transportation having a low expenditure elasticity and air transportation and travel services having a high expenditure elasticity. Overall, then, both influences are present.

b. Communication

A mixed pattern is also likely for the communication industries. Radio and Television Broadcasting services are not purchased directly by households but the volume of employment in this industry is in fact tied to regional per capita income. Station revenue from advertising, and therefore employment in regional broadcasting, depends on market size, which is related to regional per capita income. The other industries within this group produce some commodities that are consumed directly by households but most are inputs for other industries. The household expenditure elasticities are low for all commodities other than long-distance telephone services. When inter-industry demand is included, many of the industries are likely to be much more sensitive to per capita income changes than the measures of expenditure elasticity would imply. Thus the most reasonable approach is to assume that non-basic employment is influenced by both population size and per capita income.

c. Electric Power, Gas and Water Utilities

The household expenditure elasticities for the utilities are all low, indicating that they are primarily population-related. All of these commodities are also inputs for other industries so that the probable expansion in non-basic activity is greater than would be implied by the elasticity measures. This is likely to hold true for electricity in particular, and is less so for water and gas. However, household demand is important for these industries and given the values for the expenditure elasticities, population size is likely to have a much greater influence on their output than per capita income even when inter-industry demand is taken into account.

5. Trade

The region's non-basic trade industries distribute locally produced and imported commodities to regional residents. An increase in regional per capita income will probably affect both the volume and variety of retail and wholesale trade. The volume of activity will grow because many of the additional locally produced and imported commodities demanded by regional residents will be purchased directly through the region's retail industries and indirectly through its wholesale industries. Also, the growth in per capita income will increase the market size of the region and lead to an increase in the variety of retail and wholesale activities. Although some of the trade industries will be affected more than others, all non-basic trade activity is likely to expand and all non-basic employment in this industry division can be taken as primarily income-related.

6. Finance, Insurance and Real Estate

Non-basic employment in the Finance, Insurance and Real Estate industry division is also primarily income-related. The growth in the volume of savings and financial transactions as regional per capita income grows should lead to an expansion in the Banks and Other Deposit Accepting Establishments industry. Also, insurance purchases have a high expenditure elasticity of demand so that the insurance industries should expand as well. The real estate industries are likely to be affected in a similar way because of an increase in purchases of real assets. Moreover, the Security Brokers and Dealers industry should also expand because of an increase in the purchases of financial assets. Finally, even the Credit Agencies industry is likely to be affected positively through increased purchases of household durables and other commodities which depend on credit.

7. Community, Business and Personal Service

a. Education and Related Services

Employment in the Elementary and Secondary Schools industry tends to dominate non-basic employment in this industry group. Since employment in this industry is primarily related to the size of the region's population, the whole industry group can be treated as primarily population-related.

b. Health and Welfare Services

Many health services are non-market commodities provided through government health insurance plans, and employment in these industries could be viewed as primarily population-related. The consumption of these health services, however, is also likely to be related to regional per capita income since their use tends to rise with the income level of the household. Market health service employment is clearly income-related because of high expenditure elasticities of demand. Welfare services would normally be assumed to be inversely related to a region's per capita income. But given the variety of welfare activities included in this industry, it is probably better to view it as population-related. Overall, the industry group could be treated as being influenced by both population size and per capita income.

c. Religious Organizations

The Religious Organizations industry also produces a non-market commodity which is primarily population-related.

d. Amusement and Recreation Services

Most of the commodities produced by the Amusement and Recreation Services industries have high expenditure elasticities of demand so that any non-basic employment should be treated as primarily income-related.

e. Services to Business Management

Business management services are mostly inputs for other industries although some, such as the services of lawyers, accountants and architects, are also consumed by households. The commodities produced by the industries hiring business management services could have high or low expenditure elasticities of demand and the most reasonable approach is to assume that non-basic employment is affected by both influences.

f. Personal Services

Personal services are mostly consumed by households. Some of these industries, such as Private Households and Barber and Beauty Shops, produce commodities that clearly have high expenditure elasticities whereas others, such as the Self-Service Laundry industry, have low expenditure elasticities. Again, the most reasonable approach is to treat all non-basic employment in this industry group as related to both influences.

g. Accommodation and Food Services

Non-basic employment in the Accommodation and Food Services group tends to be dominated by the Restaurant, Caterers and Taverns industry and its output has a high expenditure elasticity of demand. Thus non-basic employment is primarily income-related.

h. Miscellaneous Services

Miscellaneous Services is a very mixed group of industries with varying expenditure elasticities of demand. The assumption that non-basic employment is related to both influences is likely to be a reasonable one.

8. Public Administration and Defence

Non-basic federal, provincial, and local administration produce non-market commodities that are related primarily to the population size of the region. Hence all non-basic employment in this industry division should be treated as population-related.

9. Industry Unspecified or Undefined

Since the nature of non-basic employment in the Industry Unspecified or Undefined industry division is unknown, it is best to simply ignore it or, what amounts to the same thing, to divide it between the two types of non-basic employment on the basis of the ratio determined for all of the other industries.

7.3 ESTIMATING THE COEFFICIENT h^1 FOR THE EXAMPLE REGION

Table 7-2 illustrates how income-related and population-related employment can be estimated for the example region, Cape Breton County. Column 1 of the Table provides data on non-basic employment by industry division, with the industry divisions in many cases broken down into industry groups. Data on non-basic employment by industry division were obtained from Table 6-4 and are simply the difference between total employment and basic employment by industry division. Data on non-basic employment by industry group were estimated from Table 6-3 on the basis of each industry group's share of the industry division's experienced labour force. The estimates therefore assume a common employment rate for the industry groups within each industry division. It was noted previously that the industry divisions were disaggregated into industry groups to help improve the results of the allocation process.

Column 2 shows the allocations made for each industry on the basis of the guidelines discussed in the previous section. The allocations are represented by an allocating code, with P used for primarily population-related employment, Y for primarily income-related employment, and B for employment related to both influences.

Columns 3 and 4 show the allocations of non-basic employment to the two types of employment — income-related and population-related. Non-basic employment affected by both influences was assumed to be equally divided between the two. Given the data in column 3, the coefficient h^1 can be readily determined by dividing the total income-related employment by the total experienced labour force, so that h^1 is 0.29.

Table 7-2
Estimates of Income-Related and Population-Related Non-Basic Employment, Cape Breton County, 1971

Industry	Non-Basic Employment	Allocating Code	Income-Related	Population-Related
Agriculture	237	P	—	237
Manufacturing	1 254		345	909
Food and Beverages	564	P	—	564
Other Manufacturing	690	B	345	345
Construction	1 910	B	955	955
Transportation, Communication and Other Utilities	2 390		1 010	1 381
Transportation and Storage	1 426	B	713	713
Communication	593	B	297	297
Electric Power, Gas and Water	371	P	—	371
Trade	4 729	Y	4 729	—
Finance, Insurance and Real Estate	799	Y	799	—
Community, Business and Personal Service	7 376		2 992	4 384
Education and Related	2 168	P	—	2 168
Health and Welfare	2 204	B	1 102	1 102
Religious Organizations	292	P	—	292
Amusement and Recreation	205	Y	205	—
Services to Business Management	297	B	149	149
Personal Service	968	B	484	484
Accommodation and Food	863	Y	863	—
Miscellaneous Services	379	B	190	190
Public Administration and Defence	1 641	P	—	1 641
Sub-total	20 336		10 829	9 507
Industry Unspecified or Undefined	1 739		926	813
Total	22 075		11 755	10 320

Source: Tables 6-3 and 6-4.

7.4 ESTIMATING THE PROJECT EMPLOYMENT MULTIPLIERS FOR THE REGION

Now that the values of the coefficients h^m (0.55) and h^l (0.29) have been estimated, the values of the project employment multipliers for the region can be readily determined.

1. The Pure Migrant Labour Multiplier

The pure migrant labour multiplier is appropriate to projects where all of the new jobs (direct, indirect, and induced) are ultimately filled by migrants to the region. Its value is:

$$K_m^m = 1 + \frac{h^m}{1 - h^m}$$

$$= 1 + \frac{0.55}{1 - 0.55}$$

$$= 2.22 .$$

2. The Pure Local Labour Multiplier

The pure local labour multiplier is appropriate to projects where local labour ultimately fills all of the new direct, indirect, and induced jobs. Its value is:

$$K_l^l = 1 + \frac{h^l}{1 - h^l}$$

$$= 1 + \frac{0.29}{1 - 0.29}$$

$$= 1.41 .$$

3. The Mixed Multipliers

The mixed multipliers apply to projects where both local and migrant labour fill the new jobs. The values of the mixed multipliers depend on the estimated mix of the two types of labour ultimately required to support the project and the induced non-basic activity. For example, suppose that both local and migrant labour are expected to fill the direct and indirect project jobs but that all of the labour required to support the induced non-basic jobs is expected to be local. This would produce two multipliers:

(a) One for local project labour,

$$K_1^l = 1 + \frac{h^l}{1 - h^l}$$

$$= 1 + \frac{0.29}{1 - 0.29}$$

$$= 1.41 ,$$

which is identical to the pure local labour multiplier, and

(b) One for migrant project labour,

$$K_1^m = 1 + \frac{h^m}{1 - h^l}$$

$$= 1 + \frac{0.55}{1 - 0.29}$$

$$= 1.77 .$$

By weighting the two coefficients h^m and h^l by the share of project employment ultimately filled by migrant and local labour, a combined (or overall) project multiplier can be obtained. For example, if half of the project employment is expected to be filled by local and half by migrant labour, the combined coefficient h^c would be

$$h^c = .5\,(h^l) + .5\,(h^m)$$
$$= .5\,(0.29) + .5\,(0.55)$$
$$= 0.42 .$$

Therefore the overall multiplier would be

$$K_1^c = 1 + \frac{h^c}{1 - h^l}$$

$$= 1 + \frac{0.42}{1 - 0.29}$$

$$= 1.59 .$$

If the labour ultimately required to fill the induced non-basic jobs is also expected to come from both local and migrant labour, an estimate of the coefficient h^b would be required. It is estimated in the same way as the combined coefficient h^c; that is, it is a weighted value based on the expected share of employment that is filled by local and migrant labour. Suppose, for example, that half of the non-basic employment is expected to be filled by migrant labour and half by local labour; then h^b would also equal 0.42. This would again produce two multipliers:

(c) One for local project labour,

$$K_b^l = 1 + \frac{h^l}{1 - h^b}$$

$$= 1 + \frac{0.29}{1 - 0.42}$$

$$= 1.50 \text{ , and}$$

(d) One for migrant project labour,

$$K_b^m = 1 + \frac{h^m}{1 - h^b}$$

$$= 1 + \frac{0.55}{1 - 0.42}$$

$$= 1.95 .$$

The two multipliers can also be combined into an overall project multiplier. Here, let h^c again equal 0.42, so that

$$K_b^c = 1 + \frac{h^c}{1 - h^b}$$

$$= 1 + \frac{0.42}{1 - 0.42}$$

$$= 1.72 .$$

All of the multipliers discussed in this section depend on the two coefficients h^m and h^l. Once their values have been determined, the multipliers can be tailor-made to fit the nature of the labour supply drawn to the project and the induced non-basic activity. Thus the multipliers are not only specific to the region but also specific to the nature of the project in the region.

CHAPTER EIGHT

HOW TO CONVERT THE EMPLOYMENT MULTIPLIERS INTO INCOME MULTIPLIERS

The employment multipliers are particularly useful in a project appraisal to estimate a project's impact on regional employment. Income multipliers are also required to determine its impact on a region's income and to help assess the resulting national welfare change. For these purposes, it is possible to convert the employment multipliers into income multipliers; however, the process is tedious and time-consuming and requires a large amount of data if reasonable estimates are to be made.

In this chapter, the project income multipliers are estimated in stages, by moving from less complete to more complete estimates. Since the data requirements increase with each stage, the analyst will have to determine how far the estimates can be refined from the amount of data available for the region under study. The procedure is somewhat complicated, and the discussion will draw heavily on data for the example region to illustrate and clarify the issues that arise. As the discussion proceeds, the explanation and the example will be effectively combined. While this is done to simplify the discussion, it should be recognized that the approach is applicable to any region and not just the example region, providing similar data are available. The final project income multipliers for the example region are estimated at the end of the chapter. Since they are based on the ones derived earlier, a set of consistent multipliers is now available to help appraise different aspects of a project.

8.1 THE INCOME FLOWS IN THE BASIC AND NON-BASIC SECTORS

The income flows in the economic base model were identified in Chapter Two. Measured before tax and expressed in terms of the conventional non-basic to basic ratio, these flows are

$$\frac{N_y}{B_y} = \frac{a_n\, VA_n + T_n}{a_b\, VA_b + F + T_b},$$

where, VA = the value added from regional production,
a = the share of value-added paid to regional residents,
T = the transfer payments to regional residents,
F = the income received from production elsewhere, and
where the subscripts n and b represent the non-basic and basic sectors, respectively.

Value-added from regional production consists of income to labour and capital. The income to labour can be broken down into the average wage and the

number of workers. Thus, if E_n represents the number of non-basic workers, W_n the average non-basic wage, and K_n the income to non-basic capital,

$$VA_n = E_n W_n + K_n ,$$

and, similarly,

$$VA_b = E_b W_b + K_b .$$

Since the shares of value-added paid to regional labour and capital may differ, it is useful to disaggregate a_n and a_b into two parts — one for labour income (a_n^e and a_b^e) and another for capital income (a_n^k and a_b^k). Therefore, the non-basic to basic income ratio is:

$$\frac{N_y}{B_y} = \frac{a_n^e E_n W_n + a_n^k K_n + T_n}{a_b^e E_b W_b + a_b^k K_b + F + T_b} .$$

In the employment version of the model, the non-basic to basic ratio is usually expressed simply as the ratio of non-basic employment (E_n) to basic employment (E_b). However, the experienced unemployed (U_b) were also included as part of the basic sector in this Guide so that the more complete ratio is:

$$\frac{N_e}{B_e} = \frac{E_n}{E_b + U_b} .$$

It is possible to convert the employment ratio into an income ratio if the average non-basic wage (W_n), the average basic wage (W_b), and the average unemployment insurance payment (P_b) can be estimated. This would generate a labour income ratio of

$$\frac{N_{yL}}{B_{yL}} = \frac{E_n W_n}{E_b W_b + U_b P_b} .$$

The labour income ratio is obviously not the same as the income ratio, but it does include some terms which are approximations for those in the income ratio. If the region has been defined to exclude non-residents commuting to work and if few non-residents work in the region on a temporary basis, a_n^e and a_b^e will be close to 1 and the employment income flows in the labour income ratio will approximate those in the income ratio. Moreover, $U_b P_b$ includes part of the income flow in T_b of the income ratio.

While it is possible, although somewhat difficult, to estimate the labour income ratio, data availability often precludes estimating the more complex income ratio. In practice, the labour income ratio is usually taken as an approximation of the income ratio, but how well it actually approximates the income ratio depends on how close the ratio of missing income flows is to the labour income ratio. The principal income flow in the numerator of the ratio of missing income flows is $a_n^k K_n$, the non-basic capital income paid to residents. The other income flow, T_n, can be ignored since it simply represents an internal redistribution of income and can be defined away by slightly altering the concept of income. The missing income flows in the denominator include $a_b^k K_b$, the basic capital income paid to residents; F, the capital and labour income received from production elsewhere; and $T_b - U_b P_b$, the non-unemployment insurance external transfers paid to residents.

Given that only one missing income flow is included in the numerator while three are included in the denominator, it might be assumed that the ratio of missing income flows will be quite small (i.e., much less than 1), and less than the labour income ratio. If this is true, the labour income ratio would be larger than the income ratio, which would result in an overstatement of the size of the income multiplier. It is quite possible, however, for the sum of the income flows in the denominator to be close to or even smaller than the one in the numerator. One reason for this is that a_n^k is likely to be large relative to a_b^k since many non-basic firms will be owned locally, while the basic firms will be owned largely by non-residents. This will produce a relatively small share of basic sector capital income flowing to residents. Also, if the region is depressed, it may have little investment elsewhere and the labour flows out of the region may be permanent rather than temporary. Thus F, the income received from production elsewhere, will also be small. Finally, $U_b P_b$ may make up a large share of T_b so that the absolute size of the other external transfers may also be small. All of this implies that the ratio need not be small and it could approximate the labour income ratio or even exceed it. It is therefore not possible to state on an *a priori* basis how the two ratios will compare.

With these comments in mind, the question of how to estimate the labour income ratio will now be considered. Later, the estimates will be adjusted to include other income flows and to derive a more complete income multiplier for a region.

8.2 ESTIMATING THE INCOME FROM EMPLOYMENT

8.2.1 The Desired Data for the Estimates

If the labour income ratio is to be obtained, estimates are required only for W_n, W_b and P_b, since E_n, E_b and U_b have already been determined. This section considers how to estimate W_n and W_b.

W_n and W_b represent the average non-basic and basic wage rates associated with the estimates of non-basic and basic employment, E_n and E_b. The estimates of E_n and E_b (and U_b) were obtained from the 1971 Census and are for the last week of May 1971, the week prior to the Census. Therefore they measure the flows of non-basic

and basic employment (and unemployment) in the regional economy in that particular week. Since they need not be the same as those for other weeks or for the annual flows, it would seem appropriate that the labour income estimates, and thus W_n and W_b, should also be for the last week of May 1971.

The Census employment data could be taken to represent full-time employment as suggested by the model. However, the Census employment data do not distinguish between full-time or part-time employment, and in fact represent a mix of the two. Thus it would seem appropriate for the estimates of W_n and W_b to reflect the same mix of full-time and part-time employment in the two sectors as that for the last week of May 1971. They should also reflect both the wage rates and the relative importance of employment in the different industries in the two sectors. Therefore, W_n and W_b should be weighted averages, with the weights determined by the share of employment in the different industries of the region's basic and non-basic sectors.

8.2.2 The Data Available for the Estimates

While it is possible to describe what W_n and W_b should measure, obtaining the data to actually estimate them is a very different matter. The available data will usually require compromises, so that the values obtained will only approximate the desired values. This can be illustrated by considering the available data sources.

One source is the Statistics Canada publication *Employment Earnings and Hours*[1] (Cat. No. 72-002), which provides data on average weekly earnings for the last week of each month. The data for May 1971 would then correspond to the time period required for the estimates. Moreover, the data are obtained from the payrolls of firms and include part-time and casual employees working more than the equivalent of one day a week as well as full-time employees. Thus they include the desired mix of full-time and part-time employment. Also, the data are shown by industry division and in many cases by a finer level of industry detail.

Although these data have some of the characteristics required for the estimates, they do not have all of them. One difficulty is that the geographic breakdown of the data is unsatisfactory. The industry data are shown by province and by urban area, but the urban area data, especially for small areas, provide little industry detail. Indeed, for many areas, only the industrial composite earnings rate is shown. As a result, the earnings data by industry for the province will normally have to be taken as being representative of the region. It is quite possible, however, for the average employment earnings rate in the same industry to differ between the region and province, and the average provincial earnings, therefore, may overstate or understate those prevailing in the same industry in the region.

A second and more serious difficulty is that no data are provided for some of the industry divisions. This is true for Agriculture, Fishing and Trapping, Public Administration and Defence, and for part of the Community, Business and Personal

[1]Prior to 1971, this publication was called *Employment and Average Weekly Wages and Salaries*.

Service industries. The excluded part involves the Education and Related, the Health and Welfare, the Religious Organizations, and the Private Households industries. Moreover, for some provinces such as the one for the example region, no separate data are provided for the Forestry industry. Thus the data do not permit a weighted average wage rate to be estimated for the two sectors.

A third difficulty is that the data are based on a survey of "large firms" (those with 20 or more employees). Thus the coverage of employment for the included industry divisions will vary: it will be high in industries where large firms predominate, such as in the mining and manufacturing industries, and relatively low in industries where small unincorporated firms are more common, such as in the trade, service, and construction industries.[1, 2]

In spite of these difficulties, it still may be possible to use the data to make quick but crude estimates for small regions with simple economies. For example, if a region's basic sector employment is in one industry (say, mining) and most of its non-basic employment is in another (e.g., retail trade), then the provincial data on average employment earnings for the two industries could be used as typical basic and non-basic sector wage rates. However, this approach may understate basic income if the wage rate or the industry mix in the region differs from that of the province as a whole. More importantly, it will understate non-basic income, since the average retail trade wage rate will tend to be low in relation to proprietors' average labour earnings in trade and to other non-basic average labour earnings in some of the service industries such as education and health, and public administration. The overall estimates are therefore likely to understate both the short-run and the long-run labour income multipliers.

A second source of data is the Census itself. The procedure required to estimate average employment income by industry from its data is very time-consuming and the resulting estimates provide only an approximation of the desired estimates. Yet Census data do have the merit of being complete in their industry coverage.

The procedure makes use of two sets of Census data. The first is on employment income by sex and by major occupational group, which is available from the published Census reports by province.[3] Employment income in the Census refers to 1970 income from wages and salaries, net income from business or professional practice, and net farm income. The net income from unincorporated activity (business, professional, or farm) includes both labour and capital income so that the concept of employment income is broader than that required by the labour income ratio. Employment income by major occupational group is also available for those who worked for one or more weeks in 1970 and for those who worked mainly full time (i.e., 40 to 52 weeks) during that year. Since the employment data measure mostly

[1]Coverage ratios for Canada and the provinces are given in *Employment Earnings and Hours*.
[2]A fourth difficulty could also be mentioned: the industry classification is based on the 1960 S.I.C. Manual rather than the 1970 S.I.C. Manual used for the Census. Since the 1970 revisions were not major, however, this difficulty is not significant.
[3]Statistics Canada, *1971 Census of Canada, Income of Individuals*, Vol. III, Part 6.

full-time employment, it is the latter income measure that most closely corresponds to the measure of employment.[1]

The second set of Census data is for the 1971 experienced labour force by sex, tabulated by major occupational group and by industry division. These data are also available by province in the published Census reports.[2] By applying the occupational employment income data by sex to the experienced labour force occupational data by industry and sex, it is possible to obtain estimates of average employment income by industry. These estimates are weighted averages, weighted by the 1971 occupational and sex mix for each industry in the province. Thus they measure the average employment income that would have been earned by the 1971 experienced labour force in each industry if they had worked mainly full time at the 1970 employment income rates.

The estimates of average employment income by industry, then, are annual, not weekly estimates and they refer to 1970, not 1971, dollar incomes. Moreover, they are derived from data for the province and not for the region. Their values depend on the average employment income for each occupation, the mix of occupations in each industry, the male-to-female labour force mix in each industry, and the mix of industries in each industry division, among other things. None of these need be the same for the region and the province. Indeed, they will not be the same, since the industry mix for any industry division will differ between the two and this will lead to different occupational mixes and different male-to-female labour force mixes. It is also possible that the employment income accruing to workers in the same occupation will differ between the region and the province; this is especially likely for unincorporated business, professional, and farm net income.

Some of these problems can be eliminated if regional rather than provincial data are used. That is, it would be better to obtain data on employment income by major occupational group and on the experienced labour force by major occupational group and industry division for the region rather than the province. Data on employment rather than on the experienced labour force by major occupational group and industry division would be even better so that the unemployed could be excluded from the weighted average. Obtaining such data in most cases will require a special Census tabulation and often a long waiting period. However, some unpublished Census data specific to the region can be obtained relatively quickly from Statistics Canada as shall be seen presently.

Before the labour income estimates are made, it would be useful to compare the values that can be obtained for average employment earnings and employment income by industry for the example region. Such data are shown in Table 8-1. The data in the first two columns are from *Employment Earnings and Hours*, or more accurately from *Employment and Average Weekly Wages and Salaries*, the title of the publication prior to 1971. To make them comparable with Census data, the

[1]Statistics Canada, *1971 Census of Canada, Income of Individuals*, Vol. III, Part 6, Bulletin 3.6-8, Cat. No. 94-766.

[2]Statistics Canada, *1971 Census of Canada, Labour Force: Occupations*, Vol. III, Part 3, Bulletin 3.3-9, Cat. No. 94-737.

employment earnings data are for the year 1970 and they were obtained as the average of the 12 weekly estimates converted to an annual rate.

Column 1 provides data for Nova Scotia by industry division and in some cases by selected industries within the industry divisions. The selected industries are important ones in the example region, but because of a lack of data, not all of them could be included. Column 2 shows the very limited data available for Sydney, which is taken as representative of the example region. The two estimates, for Manufacturing and Trade, differ from the values for Nova Scotia. The manufacturing employment earnings estimate for Sydney is larger than the one for Nova Scotia because of the greater importance of the primary metals industry (a relatively high-earnings industry) in Sydney. The estimate for Trade is lower for Sydney because wholesale trade, a relatively high-earnings industry, is of less significance in Sydney than in Nova Scotia and because retail trade earnings appear to be lower for Sydney than for the province.

Column 3 shows the 1970 employment income estimates for Nova Scotia obtained from published Census data by the procedure described earlier. Since employment income is a broader concept than employment earnings, it would be expected that two sets of estimates for Nova Scotia would differ. However, in three industries — Mining; Manufacturing; and Transportation, Communication and Other Utilities — where large firms predominate, the estimates are quite close. The Census data produce slightly higher estimates for Manufacturing (4.4 percent) and for Transportation, Communication and Other Utilities (2.4 percent), but slightly lower estimates for Mining (3.7 percent).

Data in *Employment Earnings and Hours* indicate that employment coverage for Finance, Insurance and Real Estate for Nova Scotia is also relatively high (82.5 percent) but in this industry the Census employment income estimates exceed the employment earnings estimates by 11.2 percent. The difference is probably due to the inclusion of proprietors' income in the Census, which would boost the estimates. The same explanation probably applies to Trade, where the Census estimates are 30 percent higher. In the Construction industry, the Census estimates are 11.1 percent lower, possibly because the employment earnings data for large firms overestimate the typical average wage and salary income for the whole industry. Another possible explanation is that the Census data underestimate the average full-time construction income flow because it includes many workers working less than the full 52 weeks. Therefore it is not clear which is the better estimate.

Column 3 also provides estimates for three industries within the Community, Business and Personal Service industries. These are based on employment income data for the predominant occupational group in each of the industries, which were then weighted by the male-to-female experienced labour force ratio for each occupation in Nova Scotia. Hence these estimates have not been made in quite the same way as the others which include a mix of different occupational groups in each industry and not just the predominant occupational group.

The final column provides estimates for Cape Breton County based on unpublished but readily obtainable Census data on employment by major occupation-

Table 8-1
Average Employment Earnings and Employment Income by Industry
for Nova Scotia, Sydney, and Cape Breton County, 1970
(dollars)

Industry	Employment Earnings		Census Employment Income	
	Nova Scotia	Sydney	Nova Scotia	Cape Breton
Agriculture	—	—	3 717	3 928
Forestry	—	—	4 751	4 553
Fishing and Trapping	—	—	4 864	4 982
Mines (including Milling), Quarries and Oil Wells	6 494	—	6 265	6 257
Manufacturing	5 518	6 050	5 760	5 768
Food and Beverages	4 377	—	—	—
Fish Products	3 894	—	—	—
Other Food and Beverages	4 766 [a]	—	—	—
Primary Metals	6 884	—	—	—
Other Manufacturing	5 899 [a]	—	—	—
Construction	7 105	—	6 394	6 427
Transportation, Communication and Other Utilities	6 019	—	6 166	5 856
Transportation and Storage	5 595 [b]	—	—	—
Water Transport and Services	4 689	—	—	—
Railway Transport	6 863	—	—	—
Other Transport and Storage	4 994 [a]	—	—	—
Communication	6 443	—	—	—
Electric Power, Gas and Water	7 250	—	—	—
Trade	4 418	3 784	5 609	5 553
Finance, Insurance and Real Estate	5 492	—	6 105	6 197
Community, Business and Personal Service	—	—	5 894	6 267
Education and Related	—	—	7 780	7 899

(Table 8-1 concluded on the next page)

TABLE 8-1 (concluded)

Industry	Employment Earnings		Census Employment Income	
	Nova Scotia	Sydney	Nova Scotia	Cape Breton
Health and Welfare	—	—	7 309	6 819
Religious Organizations	—	—	4 430	4 431
Amusement and Recreation		—	—	—
Services to Business Management		—	—	—
Personal Service	3 445 [c]	—	—	—
Accommodation and Food		—	—	—
Miscellaneous Services		—	—	—
Public Administration and Defence	—	—	6 717	6 055
Industry Unspecified or Undefined	—	—	4 794	4 909

Notes:
[a] Estimated as a residual from unrevised data.
[b] Refers to Transportation only.
[c] Refers to Amusement and Recreation, Services to Business Management, Personal Services, Accommodation and Food, and Miscellaneous Services.
Source: See text for discussion of sources.

al group and industry division. Since the data are specific to the region, they reflect the regional occupational mix in each industry rather than the provincial mix as in the previous estimates. However, the data are still unsatisfactory because they provide neither a breakdown by sex nor separate information for all occupational groups since some are combined with others. Also, the important Census data on Cape Breton County employment income by occupational group are not readily obtainable, so that data for the province as a whole had to be used. These data were then weighted by the male-to-female experienced labour force ratio in each occupational group for Cape Breton County to obtain weighted average employment income estimates by occupational group. These were then applied to the occupational data by industry to obtain the employment income estimates in column 4.

Because of the difficulties found in the unpublished data, the estimates in column 4 provide only a slight improvement over those in column 3. Indeed, since the employment income data by occupation are for the province, one would expect that the two sets of estimates would not differ significantly. A comparison of columns 3 and 4 indicates that this is true for all industries except Public Administration and Defence, where the different occupational mix produced an estimate that was about 11 percent lower.

8.2.3 How to Estimate the Income from Employment

Some of the data in Table 8-1 can be obtained relatively quickly from published sources, while other data can be obtained from both published and unpublished sources only after considerable time and expense. This means that the income flows from employment in the two sectors can be estimated in a number of different ways, with the choice dependent on the time and expense the analyst is willing to incur. Four alternatives will be discussed to explain the advantages and disadvantages of each and two of them will be illustrated with data for the example region.

Alternative One uses as much information as possible from *Employment Earnings and Hours* and collects the rest from published Census sources. Since data can be obtained relatively quickly from the first source, this approach represents a minimum effort alternative. Table 8-2 shows how it can be applied to the example region. In the table, all of the available data specific to the region are used, so that the employment earnings for Manufacturing and Trade refer to Sydney. The remaining data from *Employment Earnings and Hours* — for Mining; Construction; Transportation, Communication and Other Utilities; Finance, Insurance and Real Estate; and part of the Community, Business and Personal Service industries — are for Nova Scotia. Census data for Nova Scotia are used for the other industries.

The non-basic and basic income flows were obtained by applying the 1970 employment earnings or income estimates by industry to the Census employment estimates by industry for the last week of May 1971. They are, therefore, estimates of the income that the workers in the two sectors in the last week of May 1971 would have earned if they had worked in 1970. It should be emphasized that these are not estimates of the income flows to workers in the two sectors for 1970 because the volume of employment and the employment and unemployment rates obtained from

Table 8-2
Alternative One: Estimates of Non-Basic and Basic Employment Income by Industry for Cape Breton County

Industry	Average Employment Earnings or Income	Non-Basic Employment				Basic Employment	
		Income-Related		Population-Related			
		No.	Amount	No.	Amount	No.	Amount
	($)		($ 000)		($ 000)		($ 000)
Agriculture	3 717	—	—	237	881	18	67
Forestry	4 751	—	—	—	—	140	665
Fishing and Trapping	4 864	—	—	—	—	305	1 484
Mines (including Milling), Quarries and Oil Wells	6 494	—	—	—	—	4 095	26 593
Manufacturing	6 050	345	2 087	909	5 499	5 016	30 347
Construction	7 105	955	6 785	955	6 785	—	—
Transportation, Communication and Other Utilities	6 019	1 010	6 079	1 381	8 321	1 120	6 742
Trade	3 784	4 729	17 895	—	—	821	3 107
Finance, Insurance and Real Estate	5 492	799	4 388	—	—	6	33
Community, Business and Personal Service	—	2 992	14 566	4 384	29 048	1 034	6 378
Education and Related	7 780	—	—	2 168	16 867	155	1 206
Health and Welfare	7 309	1 102	8 055	1 102	8 055	553	4 042
Religious Organizations	4 430	—	—	292	1 294	—	—
Other	3 445	1 890	6 511	822	2 832	328	1 130
Public Administration and Defence	6 717	—	—	1 641	11 023	964	6 475
Industry Unspecified or Undefined	4 794	926	4 439	813	3 898	1 121	5 374
Total		11 755	56 239	10 320	65 446	14 640	87 265

Source: Tables 6-3, 7-2 and 8-1.

the Census for the last week of May 1971 need not, and likely will not, correspond to the same measures for 1970. Rather, they are hypothetical estimates whose sole purpose is to make use of what data are available on income by industry to estimate the income flows for the multipliers.

Alternative One produces the most easily obtainable comprehensive estimates of the income flows for the two sectors. It also has the merit of providing the closest approximations of the labour income flows required for the labour income ratio, because its estimates depend heavily on the wage and salary income data from *Employment Earnings and Hours*. The Census data, in contrast, involve a blend of labour and capital income for most industries. In Table 8-2, there will be some capital income only in the Agriculture, Forestry, Fishing and Trapping, and Health and Welfare industries since these estimates are based on Census data and unincorporated firms tend to be of some importance in all of them.[1]

The second alternative makes use of published Census data on provincial employment income by industry division. That is, it uses data similar to those in column 3 of Table 8-1. This alternative is much more time-consuming than the previous one because of the effort required to obtain the employment income estimates. However, the resulting estimates do have the merit of including the labour and capital income of proprietors as well as the labour income of employees. Since the unincorporated firms tend to be owned locally, the estimates provide a measure of the labour income flow and part of the capital income flow to regional residents. The capital income flow will accrue to both the non-basic and basic sectors. In most regions, however, unincorporated firms are likely to be of more importance in the non-basic sector. Thus the non-basic income estimates can be taken as an approximation of the overall flow of non-basic income to regional residents.

The main problem with the estimates for Alternatives One and Two is that they use employment earnings data and Census employment income data for the province and not the region. The employment earnings data, therefore, reflect the provincial rather than the regional wage and salary rates, the industry mix, and the male-to-female employee ratio. Similarly, the Census employment income data reflect the provincial employment income by occupation, the occupational mix, the industry mix, and the male-to-female labour force ratio.

There is little that can really be done about these problems without unpublished data specific to the region. However, it may be possible to make an adjustment for the different industry mix between the region and the province by disaggregating some of the industry divisions. This disaggregation represents the third alternative.

Alternative Three is really a variant of Alternative One because it is based on the only available published source of disaggregated data — *Employment Earnings and Hours*. Moreover, if the analyst wishes to continue to include the income to proprietors, and this is clearly desirable, only industries where wage and salary income

[1]The estimates for the Education and Related and the Religious Organizations industries are also from the Census but any capital income in these two industries is probably of little consequence.

predominate are likely candidates for disaggregation. These include Mining, Manufacturing, Transportation, Communication and Other Utilities, and possibly Construction. The remaining industries will have to continue to rely on the estimates of employment income from the Census either because the income to proprietors is important or because no data on them are available in *Employment Earnings and Hours*.

The final alternative involves the disaggregation of the industry divisions as suggested in the third alternative. However, it also makes use of employment income estimates from unpublished Census data that are specific to the region similar to those in column 4 of Table 8-1. These data are still based on employment income by occupation for the province, but they now also reflect the occupational mix for the region. Given the comments made earlier about the quality of these data for the example region, it is doubtful that they really produce much better estimates than the data for the province. Yet this need not be true for other regions.

Table 8-3 provides the employment income estimates for the example region on the basis of Alternative Four. In the table, Manufacturing, and Transportation, Communication and Other Utilities are disaggregated, with the data for these industries taken from *Employment Earnings and Hours*. The estimates for the remaining industries depend on the data from the Census in column 4 of Table 8-1.

A comparison of the overall employment income estimates obtained with Alternative One, the minimum-effort alternative, and Alternative Four, the more time-consuming and costly alternative, reveals that the principal difference between them is in the estimates of income-related non-basic employment income. The Alternative Four estimates are about 14 percent greater primarily because the income to proprietors is included in the Trade industry. Although there are also differences between the estimates for the other industry divisions and for the overall estimates of population-related non-basic and basic employment income, they tend to be minor in relation to what is true for Trade and for income-related non-basic employment income. Therefore Alternative One would have estimated as well as Alternative Four in this case if Census data on provincial Trade had been used instead of the data from *Employment Earnings and Hours*. However, while this is true for the example region, it need not be true for other regions.

Alternative Four is about as far as the analyst can go in refining the estimates with published and readily available unpublished data. Any further improvement requires the use of additional unpublished data and usually a long waiting time. The procedure used to obtain the estimates with the additional data is no different from what has been discussed already. Thus no further consideration will be given to the subject and the estimates in Table 8-3 will be taken as the final estimates of employment income for the example region.

8.3 ESTIMATING THE INCOME OF THE UNEMPLOYED

To complete the labour income ratio, an estimate of the unemployment insurance benefit payments to the experienced unemployed is also needed. These can be

Table 8-3
Alternative Four: Estimates of Non-Basic and Basic Employment Income by Industry for Cape Breton County

Industry	Average Employment Earnings or Income	Non-Basic Employment				Basic Employment	
		Income-Related		Population-Related			
		No.	Amount	No.	Amount	No.	Amount
	($)		($ 000)		($ 000)		($ 000)
Agriculture	3 928	—	—	237	931	18	71
Forestry	4 553	—	—	—	—	140	637
Fishing and Trapping	4 982	—	—	—	—	305	1 520
Mines (including Milling), Quarries and Oil Wells	6 257	—	—	—	—	4 095	25 622
Manufacturing	—	345	2 053	909	4 741	5 016	30 408
Fish Products	3 894	—	—	—	—	861	3 353
Other Food and Beverages	4 766	—	—	564	2 688	167	796
Primary Metals	6 884	18	124	18	124	2 787	19 186
Other Manufacturing	5 899	327	1 929	327	1 929	1 199	7 073
Construction	6 427	955	6 138	955	6 138	—	—
Transportation, Communication and Other Utilities	—	1 010	5 920	1 381	8 610	1 120	6 464
Rail Transport	6 863	233	1 599	233	1 599	455	3 123
Water Transport	4 689	—	—	—	—	505	2 368
Other Transport and Storage	4 994	482	2 407	482	2 407	60	300
Communication	6 443	297	1 914	297	1 914	65	419
Electric Power, Gas and Water	7 250	—	—	371	2 690	35	254
Trade	5 553	4 729	26 260	—	—	821	4 559
Finance, Insurance and Real Estate	6 197	799	4 951	—	—	6	37
Community, Business and Personal Service	—	2 992	14 026	4 384	28 766	1 034	6 125
Education and Related	7 899	—	—	2 168	17 125	155	1 224
Health and Welfare	6 819	1 102	7 515	1 102	7 515	553	3 771

(Table 8-3 concluded on next page)

TABLE 8-3 (concluded)

Industry	Average Employment Earnings or Income	Non-Basic Employment				Basic Employment	
		Income-Related		Population-Related			
		No.	Amount	No.	Amount	No.	Amount
	($)		($ 000)		($ 000)		($ 000)
Religious Organizations	4 431	—	—	292	1 294	—	—
Other Services	3 445	1 890	6 511	822	2 832	328	1 130
Public Administration and Defence	6 055	—	—	1 641	9 936	964	5 837
Industry Unspecified or Undefined	4 909	926	4 546	813	3 991	1 121	5 502
Total		11 755	63 894	10 320	63 113	14 640	86 782

Source: Tables 6-3, 7-2 and 8-1.

estimated if P_b, the average unemployment insurance benefit payment associated with U_b, the experienced unemployed, can be estimated. However, rather than estimate P_b separately, it is easier and quicker to estimate the total payment, P_bU_b.

The most important point to note in making the estimate is that U_b represents the experienced unemployed at a particular point of time, namely the last week of May 1971. The amount of unemployment and the corresponding unemployment rate for the experienced labour force, $U_b/(U_b + E_b + E_n)$, need not and likely will not be representative of the annual measures. Therefore the unemployment insurance benefit payment estimate should correspond to the amount and rate of unemployment that existed when the experienced labour force was measured by the Census. The measures of unemployment and the estimate of the benefits paid can be expressed in annual terms as was done with the estimates of employment income. This should not, however, be taken as an attempt to estimate the actual unemployment measures and benefits paid for a particular year, but rather as an attempt to express these amounts in annual terms so that they correspond to the other data used in the estimates.

The estimate of the unemployment insurance benefit payments can be made in a relatively straightforward manner. The data on the experienced unemployed obtained from the Census can be taken to represent the number of potential benefit receivers in the region. Some of the experienced unemployed will actually be drawing benefits; others will not because they have exhausted their claims, because they are not eligible to draw benefits, or for other reasons. Therefore, only a share of the experienced unemployed will actually be receiving benefit payments.

By drawing on data from the Statistics Canada publication *Statistical Report on the Operation of the Unemployment Insurance Act* (Cat. No. 73-001), it is possible to estimate the share of benefit receivers and the benefit payments made. This source provides annual and monthly data on the number of benefit weeks paid and the amount of benefit payments by province. The analyst's initial interest is in the data on benefit weeks paid by month, which will be used together with the Census data on the experienced unemployed. However, the two sets of data refer to different time periods. The simplest way to overcome this problem is to assume that the Census unemployment data are also representative of those for a month. Since the Census data are for the last week of May 1971, it might be assumed that the logical month to select would be May 1971. However, June 1971 is a better choice for the example region because the regional economy was moving towards its seasonal low unemployment rate in May. Thus the unemployment estimates for the last week of May are probably more typical of June than of the rest of May.

The next task is to estimate the benefit payments for Nova Scotia as a whole. This is based on the June 1971 benefit weeks paid (50 788) and on the average weekly benefit payment for Nova Scotia from the same Statistics Canada publication. Since the estimates for employment income are in 1970 dollars, the average weekly benefit payment for 1970 of $32.85 was selected as the appropriate one to use. The monthly estimate was then expressed in annual terms and Cape Breton County's share determined on the basis of its share of the experienced unemployed in the province. Hence Cape Breton County's share was:

$50\ 788 \times \$32.85 \times 12 \times 3\ 520/18\ 110$
$= \$3\ 891\ 365$.

The value of P_b consistent with this payment is \$1 105 on an annual basis or \$21.26 on a weekly basis.

It is also possible to estimate the share of the experienced unemployed drawing unemployment insurance benefits. The estimate is based on the data for Nova Scotia and consists of the annual benefit weeks paid ($50\ 788 \times 12$) divided by the annual weeks of unemployed time ($18\ 110 \times 52$). Therefore 64.7 percent or about two-thirds of the experienced unemployed would be drawing unemployment insurance benefits.

8.4 THE MULTIPLIERS BASED ON LABOUR INCOME

8.4.1 The Modified Labour Income Multiplier

The Alternative Four income estimates for employees and proprietors and the estimate of the unemployment insurance benefit payments to the unemployed provide sufficient information to estimate a "modified" labour income multiplier. It is referred to as "modified" because the income estimates include income to capital as well as to labour. However, before this is done, it would be useful to summarize the Cape Breton County income estimates (in thousands of dollars):

Non-Basic Income		
Population-related employment income	63 113	
Income-related employment income	63 894	127 007
Basic Income		
Employment income	86 782	
Unemployment income	3 891	90 673
Total Income		217 680

Given the income data, the values for the two coefficients h_y^m and h_y^l (where the subscript y stands for income) are 0.58 and 0.29, respectively. The values for the multipliers, then, are:

1. The pure migrant labour income multiplier

$$K_{my}^m = \frac{1}{1 - h_y^m}$$

$$= \frac{1}{1 - 0.58}$$

$= 2.38$, and

2. The pure local labour income multiplier

$$K^1_{1y} = \frac{1}{1 - h^1_y}$$

$$= \frac{1}{1 - 0.29}$$

$$= 1.41 .$$

8.4.2 The Relationship between the Labour Income Multipliers and the Labour Multipliers

The labour income multipliers just derived and the labour multipliers derived in earlier chapters assume a constant ratio of non-basic to total regional activity and therefore a constant ratio of non-basic to basic activity. In the pure migrant labour income multiplier it is the ratio of all non-basic labour income to total regional labour income that is constant, whereas in the pure local labour income multiplier it is the ratio of income-related non-basic labour income to total regional labour income that is constant. Similarly, the pure migrant labour multiplier assumes a constant ratio of non-basic employment to the total experienced labour force while the pure local labour multiplier assumes a constant ratio of income-related non-basic employment to the total experienced labour force.

While both sets of multipliers assume constant ratios of non-basic to basic activity, the ratios usually differ because the average labour incomes for the two sectors usually differ, and it is this difference that produces the different values for the two sets of multipliers. In addition, the basic sector includes two groups of experienced labour force members, the basic employed and the experienced unemployed, and therefore two flows of basic sector labour income, employment labour income and unemployment labour income (or unemployment insurance benefits). Since the average unemployment labour income is relatively small compared with the average basic employment labour income, the share of the unemployed in the basic sector labour force is much larger than the share of unemployment labour income in basic labour income.

The differing shares of employment and unemployment and of employment and unemployment labour income in the basic sector can create a difficulty if the two sets of multipliers are used together to make predictions. To see this, assume that a new basic job is filled by a migrant and that all of the non-basic jobs induced by the new basic job are also filled by migrants so that the pure migrant multiplier applies. If the new basic sector worker is employed at the average basic sector employment labour income, non-basic labour income would grow by 2.38 minus 1 times the change in basic sector employment labour income. Thus if the average values derived from the labour income estimates shown in Table 8-4 are used, for example, non-basic labour income would grow by 1.38 × $5 928, or by $8 180. This would have generated 1.43 additional non-basic jobs at the average non-basic labour income of $5 753.

However, the pure migrant labour multiplier is 2.22, which means that only 1.22 additional non-basic jobs would have been predicted by this multiplier.

The labour multiplier, therefore, would have understated the effect of the creation of the new basic sector job on non-basic employment. This understatement occurs because the predicted change is determined by the response of non-basic employment to an average change in the basic labour force, where the average is determined by the mix of basic employment and unemployment. Since employed workers have larger labour incomes than unemployed workers, their labour incomes will induce more non-basic jobs. Therefore the prediction based on the average mix in the basic labour force is biased downwards when basic employment is created. In a similar way, the prediction will be biased upwards if, say, a migrant unemployed worker is added to the region's labour force.

The two sets of multipliers, therefore, will produce inconsistent results unless the change in labour force activity involves labour force members who earn the average basic sector labour income for both employed and unemployed workers. The problem, however, can be remedied by the simple assumption that the ratio of average basic employment labour income to average non-basic labour income is also a constant. In this way it is possible to derive employment multipliers consistent with the labour income multipliers.

Such multipliers can be obtained with the use of the data for the example region in Table 8-4. The pure migrant employment multiplier can be obtained in the way described in the earlier example. That is, one basic sector job would generate

Table 8-4
Labour Income, the Experienced Labour Force in the Basic and Non-Basic Sectors, and the Average Labour Income by Sector for Cape Breton County

Sector	Labour Income	Experienced Labour Force	Average Labour Income
	($ 000)	(No.)	($)
Basic Sector	90 673	18 160	4 993
Employment	86 782	14 640	5 928
Unemployment	3 891	3 520	1 105
Non-Basic Sector	127 007	22 075	5 753
Income-Related	63 113	11 755	5 369
Population-Related	63 894	10 320	6 191
Total	217 680	40 325	5 410

Source: Tables 6-4, 7-2 and page 125.

1.38 × \$5 928/\$5 753 = 1.43 non-basic sector jobs. Therefore, the pure migrant employment multiplier associated with labour income is[1]

$$K^m_{mye} = 2.43 .$$

The coefficients for the first round and subsequent rounds in the employment multiplier can also be easily derived. The first-round coefficient is obtained from the first-round non-basic income creation — that is, by multiplying the average basic employment labour income by 0.58 (the migrant income coefficient) and then dividing by the average non-basic labour income. This produces a value of 0.60 for the coefficient. The subsequent-rounds coefficient will have a value equal to the income coefficient (0.58) since the additional non-basic jobs are produced and valued at the average non-basic labour income. Therefore,

$$K^m_{mye} = 1 + \frac{h^m_{mye}}{1 - h^m_y}$$

$$= 1 + \frac{0.60}{1 - 0.58}$$

$$= 2.43 .$$

In a similar way, a pure local employment multiplier associated with labour income can be obtained through the use of the average basic employment labour income, the pure local labour income multiplier (1.41), and the average non-basic income-related labour income (\$5 369). Hence

$$K^l_{lye} = 1 + \frac{h^l_{lye}}{1 - h^l_y}$$

$$= 1 + \frac{0.32}{1 - 0.29}$$

$$= 1.45 .$$

It is also possible to obtain two other pure multipliers consistent with the labour income multipliers, which will be particularly useful for the discussion in Chapter Nine. These multipliers measure the effect of a change in unemployment on non-basic employment and are derived by assuming a constant ratio between the average unemployment labour income and the average non-basic labour income (or average non-basic income-related labour income).

[1]It is important to stress that while the absolute or dollar average labour income measures are used to make the estimates, it is the ratio of average basic employment labour income to non-basic labour income that actually determines the size of the employment multiplier.

The first of these multipliers applies to a situation where a migrant unemployed worker is added to the regional labour force and all of the induced non-basic jobs are also filled by migrants. This pure migrant unemployment multiplier associated with labour income is obtained from the average unemployment labour income ($1 105), the pure migrant labour income multiplier (2.38), and the average non-basic labour income ($5 753)[1], so that

$$K^m_{myu} = 1 + \frac{h^m_{myu}}{1 - h^m_{my}}$$

$$= 1 + \frac{0.11}{1 - 0.58}$$

$$= 1.26 .$$

The second multiplier measures the effect on non-basic employment when a local worker is unemployed and when all of the induced non-basic jobs are filled by local workers. It can be obtained from the average unemployment labour income, the pure local labour income multiplier (1.41), and the average income-related non-basic labour income ($5 369). Hence,

$$K^l_{lyu} = 1 + \frac{h^l_{lyu}}{1 - h^l_{ly}}$$

$$= 1 + \frac{0.06}{1 - 0.29}$$

$$= 1.08 .$$

All of the multipliers have again been presented in their "pure" form, but by combining the first-round and subsequent-rounds coefficients, mixed multipliers can also be obtained. Since the procedure is no different from the one set out earlier, it will not be repeated here.

8.4.3 The Missing Income Flows in the Labour Income Multiplier

The labour income multipliers are based on three estimated income flows: labour income to employees, labour and capital income to proprietors, and unemployment insurance benefit payments to the experienced unemployed. While the estimates include some of the capital income to local residents, they do not include all of it. In particular, they do not include the income to capital from incorporated business or, more properly, the investment income to local residents from local production.

[1]The ratio of unemployment labour income to non-basic labour income obtained from the estimates($1 105/$5 753 or 0.19) may be somewhat low given the changes in the Unemployment Insurance Act in 1971. Hence, if the analyst is to apply such a multiplier, a revised ratio may be appropriate.

Such income will appear in both the basic and non-basic sectors, so that it is not possible to state *a priori* how this missing income affects the size of the multiplier in any particular case.

Also missing from the multipliers are the income flows from external transfers (other than unemployment insurance) and the income to labour and capital from activity elsewhere. Both of these are part of the basic sector and of some importance for the example region. Therefore the estimates probably understate the size of the income flows to the basic sector. Thus the "modified" labour income multipliers will probably overstate the size of the overall income multipliers. It is possible to include some of the missing flows in the multiplier estimates, and the next two sections will show how this can be done.

8.5 OTHER EXTERNAL TRANSFER INCOME

It is possible to make the income estimates more comprehensive by including external transfers other than just unemployment insurance. One obvious problem in doing this is obtaining the necessary data. A second and less obvious problem has to do with the nature of the income flows already estimated. This has been discussed before but it is worth repeating because of its pertinence to this discussion.

The income estimates already obtained are based on the employed and unemployed experienced labour force as measured by the Census for the last week of May 1971. They are annual projections of what the employed experienced labour force would have earned if they had worked mainly full time in 1970 and of what the unemployed experienced labour force would have received in unemployment insurance benefits at the 1970 benefit rates. These income estimates will not correspond to the 1970 income flows because the size of the experienced labour force and the amount of employment and unemployment for 1970 will not be the same as that for the last week of May 1971. The income estimates will also not correspond to the 1971 income flows because the size of the labour force and the amount of employment and unemployment for the last week of May will differ from those for all of 1971 and because the incomes are 1970 and not 1971 dollar incomes.

The fact that the employment and unemployment income estimates will not correspond to those for either 1970 or 1971 poses a problem of comparability with any other data used to extend the income estimates because these other data will be for a specific year. The problem then becomes one of selecting data for the particular year that corresponds most closely to the income estimates already made. Given that 1970 dollar incomes are used, the best choice is probably data for that year.

Two important external transfer flows can be estimated relatively easily. The first is the flow of Old Age Security and Guaranteed Income Supplement payments. Data on these payments by province for the fiscal year ending March 31, 1971 — the fiscal year closest to the desired 1970 calendar year — can be obtained from the *Canada Year Book*.[1] The region's share of the provincial payments can then be esti-

[1]Statistics Canada, *Canada Year Book*, 1972-73, Cat. No. 11-202E.

mated on the basis of its share of the age group eligible to receive them, those 65 years of age and older. Such data can be obtained from the Census. Estimates for Family and Youth Allowances are made in a similar way. Again, data on payments by province can be obtained from the *Canada Year Book* and the region's share estimated on the basis of Census data on the share of the age group eligible to receive them. For the example region the procedure generates an estimate of $11 960 000 for Old Age Security and the Guaranteed Income Supplement and $4 252 000 for Family and Youth Allowances, or an additional $16 212 000 of basic sector income.

The remaining external transfers are much more difficult to estimate. Table 8-5 sets out the type of transfer payments (excluding interest on the public debt) found in the National Accounts. The data for 1970 are shown by level of government for Canada and Nova Scotia. The data for Canada come from the revised version of the National Accounts.[1] The data for Nova Scotia were obtained from three sources. The totals for each type of governmental transfer and the Canada Pension Plan payments are from *Provincial Economic Accounts* (Cat. No. 13-213), a Statistics Canada publication. The data for federal government transfer payments are from the sources used previously to estimate the three external transfers for Cape Breton County. The Unemployment Insurance payments data, however, are total 1970 payments rather than the annual amount related to the estimates for June 1971. The provincial government transfers come from another Statistics Canada publication, *Provincial Government Finance* (Cat. No. 68-207). The provincial estimate is for social welfare payments and is only a rough estimate because of the difficulty of allocating provincial government transfers to persons, to the types of transfers shown in Table 8-5. One final comment about the data in the table: some of the estimates of the provincial and federal transfers for Nova Scotia are for the fiscal year ending March 31, 1971 rather than the 1970 calendar year. Therefore they may overstate the 1970 calendar year amounts as represented by the totals for each type of government transfer.

In the National Accounts, the personal sector includes not only households but also non-profit institutions such as charitable institutions, labour unions, and universities. External transfer payments to non-profit institutions should not be included as part of basic sector income. Such payments for the most part will lead to the payment of basic sector wages and salaries which have already been estimated as part of basic sector income from employment. To include them again as part of external transfers means counting them twice. This, of course, is not true for external transfer payments to households since they are an additional source of household income.

The data in Table 8-5 indicate that the previous estimates account for a large share of the federal government transfers to persons since the three transfers already estimated make up about 72 percent of the total for Nova Scotia. The remaining $52 million include transfers to both households and non-profit institutions. Without data on the provincial distribution of the remaining federal transfer payments, it is not possible either to separate the payments to households from those to non-profit insti-

[1]Statistics Canada, *National Income and Expenditure Accounts*, Vol. I; *The Annual Estimates 1926-1974*, Information Canada, Ottawa, 1976, Cat. No. 13-531, Table 50, pp. 270-271.

Table 8-5
Government Transfer Payments to Persons, Canada and Nova Scotia, 1970 (millions of dollars)

Government and Type of Transfer	Canada	Nova Scotia
Federal Government		
Family and Youth Allowances	618	24[a]
Pensions — World Wars I and II	197	
War Veterans' Allowances	102	
Unemployment Insurance Benefits	695	27
Prairie Farm Assistance Act	6	—
Pensions to Government Employees	216	
Old Age Security Fund Payments	1 862	83[a]
Assistance to Immigrants	2	
Grants from Canada Council	30	
Scholarships and Grants — Research	99	
Adult Occupational Training Payments	148	
Miscellaneous	82	
Total Federal	4 057	186
Provincial Governments		
Direct Relief	535	
Old Age and Blind Pensions	18	26[b]
Mothers and Disabled Persons Allowances	41	
Workmen's Compensation Benefits	230	
Pensions to Government Employees	75	
Grants to Post-Secondary Institutions	889	
Grants to Benevolent Associations	432	
Miscellaneous	391	
Total Provincial	2 611	58
Local Governments		
Direct Relief	211	
Grants to Private Non-Commercial Institutions	2	
Total Local	213	7
Canada and Quebec Pension Plans	104	4
Total	6 985	255

Notes:
[a]For fiscal year ending March 31, 1971.
[b]Refers to social welfare payments (see text).
Source: See text for discussion of sources.

tutions or to estimate Cape Breton's share of Nova Scotia's transfers to households. Obtaining a provincial breakdown of the remaining types of federal transfers is very time-consuming, and estimating the Cape Breton County share can be done only in a very crude way. Since about three-quarters of the federal transfers to Nova Scotia have already been allocated, the quickest and easiest approach is simply to allocate the remaining $52 million on the basis of the County's share of the province's population. This produces an estimate of $8.5 million of additional federal transfers.

For provincial government transfers, the estimate of social welfare payments to persons is taken to approximate provincial transfers to households. Again, the quickest and easiest way to estimate Cape Breton County's share is on the basis of its share of the province's population. This produces an estimate of $4.3 million in provincial external transfers.

Local government transfers for social welfare are normally funded in part by local government and in part by other levels of government by means of grants to local government. Local government grants to non-profit institutions could be funded from both internal and external sources as well. Since it is difficult to determine either the mix of social welfare and non-profit institutional transfer payments or the mix of internal and external funding, and since the amount of local government transfer payments is likely to be small, it is best to ignore them in the estimates of external transfers.

The final transfer payment, Canada Pension Plan payments, can be estimated in the same manner as the Old Age Security and Guaranteed Income Supplement. This produces another $700 000 in external transfers for Cape Breton County.

The procedure described above produces the following estimates (in thousands of dollars) of 1970 external transfer payments for Cape Breton County:

Federal Transfers	
Old Age Security and Guaranteed Income Supplement	11 960
Family and Youth Allowances	4 252
Other Federal Transfers	8 500
Provincial Transfers	4 300
Canada Pension Plan Payments	700
Total	29 712

8.6 OTHER EXTERNAL INCOME

Two sources of external income remain to be estimated — the income to labour and to capital from activity elsewhere. Without data on resident employment elsewhere and on the share of average employment income earned elsewhere that is remitted to the region, it is not possible to estimate the flow of external income to labour. Data on resident employment elsewhere are not available, but even if they were, estimating the share of average employment income earned elsewhere that is remitted to the region would be a formidable task. Consequently, the labour income from

The only approach that can be suggested is to assign the various income types to the two sectors on the basis of crude assumptions. Since pension income includes Canada Pension Plan payments and other government pension payments which have already been estimated as part of external transfers, it might be reasonable to exclude it from the estimates to avoid double counting. Mortgage income is paid to private as opposed to institutional investors and primarily consists of payments on residential mortgages. Such payments are part of consumption expenditures and mortgage interest could therefore be assigned to the non-basic sector. Bond interest is likely to be dominated by government (especially federal government) interest payments so that it can be assigned to the basic sector. Given the previous argument about bank interest, it could also be assigned to the basic sector along with foreign income. The remaining income types — gross dividends, estate income, and other Canadian investment income — can not be assigned to either of the two sectors in any meaningful way; it will be assumed, therefore, that they are split equally between the two. On the basis of the data in Table 8-6, these assignments produce crude estimates of $5 011 000 for basic investment income and $1 185 000 for non-basic investment income.

Dividing non-basic investment income into its population- and income-related components is, of course, not really possible given the type of data estimated. However, since such a breakdown is required to obtain the final multipliers, it will be assumed that mortgage interest, which is tied to residential construction, is population-related and that the remaining non-basic investment income is equally divided between the two. This produces $648 000 of population-related investment income and $537 000 of income-related investment income. The results, while again crude, will have little effect on the size of the final multipliers.

Before the discussion of the *Taxation Statistics* data is concluded, two other comments should be made. First, since *Taxation Statistics* provides data on income for employees and unincorporated business, it might be assumed that such data could be used in place of, or as a check on, the estimates of employment income. Unfortunately, this is not possible. The two sets of data are for different sized labour forces and different amounts of employment and unemployment. As noted before, the employment income estimates are hypothetical, not actual. Also, as a data source on regional income, the *Taxation Statistics* data are incomplete because they only include income for people who file tax returns, and not all people are required to file tax returns. Even for those who do file them, the reported income is understated because not all income is taxable and because not all taxable income is reported.[1] This implies that the investment income estimates will also understate the actual flow for the region.

[1]The Old Age Security and Guaranteed Income Supplement is an obvious example of *Taxation Statistics* understating regional income. This is because the Guaranteed Income Supplement was not taxable and because many old age security recipients had incomes below the level required to pay tax. Hence, *Taxation Statistics* produces an estimate of only $3 544 000 in Old Age Security payments compared with the estimate of $11 960 000 obtained in Section 8.5 for both types of payments.

8.7 THE FINAL INCOME MULTIPLIER ESTIMATES

The income estimates have been carried as far as possible so that the final income multipliers can now be estimated. It would be useful, however, to summarize the estimated income flows for the example region first. The non-basic and basic income estimates (in thousands of dollars) are as follows:

Non-Basic Income			
Population-Related			
Employment income	63 113		
Investment income	648	63 761	
Income-Related			
Employment income	63 894		
Investment income	537	64 431	
Total Non-Basic Income			128 192
Basic Income			
Employment income		86 782	
Unemployment insurance benefits		3 891	
Other transfer income		29 712	
Investment income		5 011	
Total Basic Income			125 396
Total Income			253 588

The income estimates include labour income to employees, labour and capital income to unincorporated activity, capital income to investment, and external transfer income. Therefore all of the income flows required to estimate the overall income multipliers are included except the income to labour from activity elsewhere. Since this latter income flow is not included, basic sector income will be understated.

The income estimates are now broader than those for just employment income so that the multipliers will apply to other types of basic sector income and not just income from employment. The distinction between the short-run and long-run multiplier nevertheless remains. The short-run multiplier is applicable to projects where all of the extra income accrues to the existing regional population while the long-run multiplier is applicable to projects where it all accrues to new regional residents. It will be useful to continue to refer to the two multipliers in terms of the source of the labour filling new basic and non-basic jobs because this is the context in which the multipliers will usually be used.

On the basis of the income estimates, the long-run or pure migrant multiplier is now

$$\frac{1}{1 - h_y^m}$$

$$= \frac{1}{1 - 0.51}$$

$$= 2.04 ,$$

and the short-run, or pure local multiplier is

$$\frac{1}{1 - h_y^l}$$

$$= \frac{1}{1 - 0.25}$$

$$= 1.33 .$$

The more typical mixed cases can be estimated in the same manner as the employment multipliers in Chapter Seven and need not be discussed again.

Two further comments should be made before this discussion is concluded. The first is that the multipliers apply to before-tax basic sector income and produce estimates of the before-tax change in non-basic and total regional income. It is a relatively simple matter to convert the multipliers to after-tax values by applying typical average tax rates for the long-run multiplier and typical marginal tax rates for the short-run multiplier to the estimates of basic and non-basic income. Since the multipliers are simple ratios, the after-tax multipliers will only differ from the before-tax multipliers if some of the income flows are taxed at rates different from others. This was true for the 1970 estimates because a large share of transfer income was not taxed at all. If an adjustment to the estimates were made, it would lead to a reduction in the size of non-basic income relative to basic income and would produce smaller multiplier values. However, it would not be expected that the adjustment would produce results significantly different from the before-tax multipliers, and since the latter are somewhat easier to apply, the adjustment has not been shown.

The second comment refers only to the short-run or pure local multiplier. If a short-run increase in basic and non-basic employment is supported by a reduction in unemployment, the region will gain some extra basic and non-basic income but lose some of its unemployment insurance benefit payments. The overall change in regional income will therefore be somewhat below the short-run multiplier estimate. The difference, in fact, is not likely to be very large, but it is relatively simple to

adjust the short-run model to take the lost unemployment insurance benefits into account. This can be done by altering the model to make unemployment insurance benefits inversely related to regional income. Hence, if

Y = regional income,
$B_{yu} = P_b U_b$ = regional unemployment insurance benefits,
B_{yo} = other regional basic sector income, and
N_y = non-basic sector income,

then in the model,

$$\begin{aligned} Y &= B_{yu} + B_{yo} + N_y \\ B_{yu} &= -\,uY \\ B_{yo} &= \bar{B}_{yo} \\ N_y &= a + h_y^1 Y \end{aligned}$$

$$\text{so that, } Y = \frac{a + \bar{B}_{yo}}{1 - h_y^1 + u},$$

and the multiplier is now

$$\frac{1}{1 - h_y^1 + u}.$$

The coefficient h_y^1 has already been estimated and is equal to 0.25. The coefficient u is simply the ratio of unemployment insurance benefit payments to total regional income, and on the basis of the income estimates is equal to 0.02. Thus the adjusted short-run multiplier is now 1.30.

CHAPTER NINE

THE ROLE OF THE REGIONAL MULTIPLIER IN PROJECT APPRAISAL

The regional multiplier most commonly enters into an appraisal of a project as part of an analysis of a project's impact on regional income and employment. Since policymakers and regional residents are both interested in this question, regional impact analysis provides an important reason for estimating regional multipliers.

An equally important but less common use for the regional multiplier is to help evaluate a project's effects on consumers' well-being or welfare. This type of analysis, usually referred to as benefit-cost analysis or simply project appraisal, takes a national rather than a regional point of view. The regional multiplier, however, is still applicable and is used to estimate the project-related changes in regional non-basic activity to determine whether this extra or incremental activity could produce a welfare gain for the nation. Such a gain could arise if the non-basic activity is incremental for the nation as well as the region and if its value exceeds the social opportunity cost of the resources required to support it.

While both types of analyses require estimates of the change in regional non-basic activity, the estimates differ because the two analyses usually consist of very different comparisons. Regional impact analysis is concerned with how the existing level of regional activity will change as a result of a project, and is typically based on a comparison of the existing level of regional activity (the initial equilibrium) with the level that would prevail once a project is in place and all of the repercussions on the regional economy have worked themselves out (the final equilibrium). Project appraisal, in contrast, involves a comparison over time between the level of regional activity with a project and the level that would have prevailed in the absence of a project if the regional economy had continued along its long-run growth path. Since the comparisons are different, the definitions of the multiplicand and of the types of multipliers that apply to it are also different. The previous discussion essentially dealt with regional impact analysis because it is the common type of project-related analysis at the regional level. This chapter concentrates on the second type of analysis and considers the problems of defining the relevant multiplicand and selecting the relevant multipliers for a project appraisal.

The first section discusses a problem common to both types of analyses, that of the displacement of other regional activity by a project. The problem was not considered previously because it is not usually taken into account in regional impact analysis. Yet if displacement does occur, it will lead to a smaller change in regional activity than would be predicted by this type of analysis. While displacement is important for regional impact analysis, it is crucial for project appraisal since the welfare change for the nation cannot be properly evaluated without taking the displacement of other economic activity into account. Therefore the next section considers the changes brought about by a project and, in particular, the problem of displacement in the region and in the rest of the nation. After this is done, the important question

of how a project could lead to incremental non-basic activity in both the region and the nation is considered. The final two sections provide a set of detailed comments on how to estimate the incremental non-basic activity for a project appraisal.

9.1 PROJECT-RELATED DISPLACEMENT IN THE REGION

In regional impact analysis, the direct and indirect regional project activity (employment and labour income) is usually taken to represent incremental activity and forms the multiplicand to which the multiplier is applied. It is possible, however, for the multiplicand to be smaller than the direct and indirect project activity if other regional activity is crowded out or displaced.

Displacement could result if a project's output is competitive with that of other regional firms and if the demand for the regional industry's output is not highly elastic. The increased regional supply will lower market price and reduce the rate of return and the market shares of competing regional firms. Output and employment in other regional firms, therefore, will be lower than they otherwise would have been and some marginal firms may even be forced to close down.

Displacement could also come about because of the increased demand for regional inputs by a project. If the input supply curves are not highly elastic, the increased demand will push prices up and increase the costs for other firms using the same inputs. This could reduce output and employment in other firms and cause some marginal firms to be completely crowded out. Displacement because of the increased competition for inputs is most readily apparent in a region that is closed to the flow of labour and operating at the full-employment level. The labour supply required to support a project in this case has to be bid away from other regional activity or come from new entrants to the regional labour market. Since the former is the more likely source, a project will lead to some displacement of other regional activity.

In more realistic cases where the region is open to the flow of labour, the increased competition for specialized resources could still lead to displacement. For example, in natural resource projects, the increased competition for limited regional forestry, mineral, or fishery resources could raise costs for existing regional producers and displace other regional production. The increased competition for skilled labour could have the same effect even in regions suffering from chronic unemployment and an overall net outflow of labour.

Displacement because of the competition for skilled labour is most likely to occur during the construction phase of a project. In major projects, the construction labour force will usually consist primarily of migrant workers, although some local workers will also be employed. Given the seasonality of construction activity and the limited supply of skilled construction labour in most regions, this phase often leads to a postponement or displacement of other regional construction activity. The same result could also arise in smaller projects, especially if there is pressure on some particular construction skill.

The competition for skilled labour is less likely to displace other activity during the operating phase since migrant workers can often be used to satisfy the skilled labour requirements. However, if a project finds it difficult to attract and hold migrant skilled labour, this could have an effect on other regional firms employing the same labour skills.

If a project does lead to the displacement of other regional activity, the change in basic activity will be smaller than the activity associated with a project, and the multiplicand should be adjusted to take this into account. The marketing analysis will help identify any displacement that may arise because of the increased competition on the market for regional output. Similarly, the marketing and economic analyses will help identify any likely displacement from the increased competition for regional inputs. The estimates of the likely displacement, measured in man-years of employment or the wage bill lost, can then be used to adjust the project multiplicand before the regional multipliers are applied. Such a procedure will produce better estimates of a project's impact on regional income and employment.

9.2 A PROJECT'S EFFECTS ON THE NATION

9.2.1 The Modified Analytical Framework

Project appraisal, the analysis of the welfare change, takes a broader perspective than regional impact analysis in that it is concerned with a project's effects on the nation as well as the region. If these effects are to be determined, the region can no longer be viewed in isolation from the rest of the nation but must be treated as part of a system of regions within the national economy.

The simplest approach is to use a two-region system, with Region A being the location of a project and Region B the rest of the nation and with Region A being small relative to Region B. In the absence of a project, the two regions and the nation can be viewed as moving along some long-run equilibrium growth path. In each region, there will be some long-run equilibrium unemployment rate, some long-run participation rate appropriate to the long-run unemployment rate, and rates of inflow and outflow of labour which are just sufficient to maintain the unemployment rate.

The nation will also have some long-run equilibrium unemployment rate, which is the one that generates full employment for the economy as a whole. However, the national unemployment rate is an average and need not be the same as the long-run unemployment rates in the two regions. To account for the problem of slow-growth regions, it will be assumed that the long-run unemployment rates differ in the two regions. Region A will be assumed to suffer from chronic unemployment and have a long-run unemployment rate above the national average. Region B's rate, therefore, will be below the national average, but since B makes up a large share of the nation, its rate will in fact tend to approximate the national average. The nation will also have a long-run participation rate appropriate to its long-run unemployment rate. Again, the regional rates need not be the same as the national rate. Indeed,

since Region A suffers from chronic unemployment, the two participation rates will likely differ, with A's rate being below B's and with B's rate approximating the national average.

The national and regional economies are viewed as open with respect to the flows of trade, capital, and labour. However, it will be assumed initially that the national economy is closed to the flow of labour to avoid the thorny problem of external migration in the early stages of the discussion. Therefore the flow of migration initially will be assumed to be entirely internal.

In long-run equilibrium, the unemployment rate in Region A will exceed that in Region B. The difference between the two regional rates can be viewed as an equilibrium difference that is maintained by the flow of internal migration. If the long-run equilibrium is disturbed and the regional unemployment rates differ from their long-run rates, the flow of internal migration will adjust to bring the rates back into line.[1]

When a project is imposed on Region A, it will disturb the long-run equilibria in the two regional economies and produce a period of adjustment that will eventually lead to the establishment of new and different long-run equilibria. The disturbance of the equilibria will also produce a change in the flow of non-basic activity in the two regions that will be the overall result of the two opposing sets of changes — the expansionary effects of project spending and the contractionary effects of the displacement brought about by a project. The overall or national change is simply the sum of these changes in the two regions and it could be positive, negative or zero. Determining what the national change will be requires that the two sets of changes for the regions first be identified. They can then be combined to determine the overall national change.

9.2.2 The Expansionary Effects

The expansionary effects of project spending are considered before any displacement of other activity is taken into account, so that the project spending and any induced spending out of the incomes earned on a project are viewed as incremental for the two regions and the nation. The project spending includes spending on regional value-added in Region A. It also includes spending on regional value-added in

[1]The discussion assumes that the unemployment rate applies to the whole labour force because this is the most familiar concept of an unemployment rate. However, a better choice as a regulator of the flows of internal migration may be the temporary sector unemployment rate which is obtained by dividing the regional labour force into two groups with very different employment and unemployment experiences. One group (the permanent employment sector) consists of workers who, because of their occupations or seniority, are almost never unemployed. The second group (the temporary sector) consists of workers who are either unemployed or who are employed in jobs that are not expected to provide continuous employment. This latter group includes workers with low seniority and workers employed in cyclical or seasonal activities. The temporary sector unemployment rate is then a measure of unemployment in the temporary sector of the regional economy. See Jenkins, Glenn P., and Kuo, Chun-Yan, "On Measuring the Social Opportunity Cost of Permanent and Temporary Employment", *Canadian Journal of Economics*, Vol. XI (1978), pp. 220-239.

Region B for the inputs imported by a project from that region. These expenditures represent an injection into the two regional economies of ΔJ_a and ΔJ_b, respectively.

The increased spending in Region A will lead to a multiplied increase in A's income of ΔY_a, where

$$\Delta Y_a = K_a \Delta J_a .$$

When A's income rises it will induce an increase in A's imports from B to support A's extra activity of

$$m_{ab} \Delta Y_a = m_{ab} K_a \Delta J_a ,$$

where m_{ab} is Region A's propensity to import from Region B. Since A's imports from B are B's exports to A, the increase in B's exports will lead to an increase in B's income of ΔY_b, where

$$\Delta Y_b = (m_{ab} K_a \Delta J_a) K_b .$$

The rise in B's income will, in turn, induce an increase in B's imports from A and this will lead to further rounds of increased exports, income and imports for the two regions. Since each round of induced imports (and exports) will be smaller than the previous round, the process will eventually come to a halt and a new equilibrium will be established. Yet given that Region B is large relative to Region A, a good deal of its trade will be internal rather than external and its propensity to import from A will probably be quite small. Little extra income, therefore, will be induced in the two regions after the first round of induced imports and thus the initial changes in income can be viewed as equivalent for all practical purposes to the final changes. Thus the change in national income (ΔY_c) as a result of the spending on a project in Region A will be

$$\Delta Y_c = \Delta Y_a + \Delta Y_b , \text{ or}$$
$$\Delta Y_c = K_a \Delta J_a + (m_{ab} K_a \Delta J_a) K_b .$$

The project spending in Region B will also have an expansionary effect on that region of $K_b \Delta J_b$, but since little of this extra income will leak out to Region A, the change for the nation will approximate the change for Region B. Therefore the overall change in national income will be the sum of the changes in the two regions, or

$K_a \Delta J_a$ in Region A, and
$K_b \Delta J_b + (m_{ab} K_a \Delta J_a) K_b$ in Region B.

Finally, the change in non-basic income for the two regions will be,

$(K_a - 1)\,\Delta J_a$ in Region A, and
$(K_b - 1)\,(\Delta J_b + m_{ab} K_a \Delta J_a)$ in Region B.

Again, the sum of the two will represent the incremental induced or non-basic income for the nation.

9.2.3 The Expansionary Effects and the Flow of International Trade

The expansionary effects were defined in terms of regional value-added and therefore exclude any imports for the nation that arise from the extra national spending. However, the extra national spending could lead to other adjustments in the flow of trade between the nation and the rest of the world and, in particular, to a reduced flow of exports and a further increased flow of imports. Both of these will serve to offset part of the expansionary effects for the two regions and the nation and will cause them to be smaller than was indicated in the previous discussion.

The additional adjustments to the flow of international trade could arise if the extra national spending leads to an increased demand for internationally tradeable commodities (i.e., commodities that have their prices, in foreign currency, determined by international market conditions). Canada is normally a price taker for such commodities and faces given Canadian dollar border prices (the foreign currency prices times the foreign exchange rate) based on the c.i.f. border prices for foreign suppliers or the f.o.b. border prices for domestic suppliers.

The domestic price of an internationally tradeable commodity differs from its border price because of market distortions (tariffs, taxes, subsidies and quotas) and domestic transportation costs. If domestic transportation costs are initially ignored, the domestic price of an imported commodity consists of the Canadian dollar border price plus the tariff and taxes and minus any subsidy. This domestic price can be viewed as an import supply price since Canada faces a perfectly elastic supply of imports at this price. Similarly, the export demand price consists of the Canadian dollar border price plus any export subsidy and minus any export tax. At this domestic price, Canadian exporters face a perfectly elastic demand for their exports. Import and export quotas, when effective, are another market distortion which serves either to push up the import supply price or pull down the export demand price.

An exportable commodity is one for which there is an excess domestic supply of the commodity at the export demand price. Part of the domestic industry's output will then be used to satisfy domestic demand and the rest will be exported. An importable commodity is one with an excess domestic demand for the commodity at the import supply price. In this case, part of domestic demand will be satisfied by domestic production and part by imports, although it is possible for domestic consumption to be satisfied entirely by imports.

Some commodities produced by a country may be internationally tradeable but not internationally traded. If the internal price of a commodity, determined by domestic market conditions, is at or close to its import supply or export demand price, then the country would neither import nor export the commodity. However, it could still be tradeable since a change in domestic demand or supply could cause it to be traded. Indeed, the import supply and export demand prices for such commodities could be viewed as setting internal ceiling and floor prices, in that competition from import suppliers would prevent the internal price from rising above the ceiling and competition from foreign demanders would prevent it from falling below the floor.

If a country is a significant importer or exporter of a commodity relative to total world trade, it may be able to influence the border price through the collusion of domestic importers or exporters or through the use of tariffs or export taxes. While such a commodity would still be tradeable, the country would no longer be a price taker on international markets. It is most unlikely that the imports of a small, open economy such as Canada's will make up more than a small fraction of total world trade in any commodity. Therefore Canada can be viewed as a price taker on its import markets. Canada is also likely to be a price taker on its export markets, although it is possible that it can set the border price for some commodity exports.

It is difficult to conceive of any commodity that is not traded internationally and is therefore both not traded and non-tradeable. Yet as a practical matter there are many commodities for which there is no significant international trade either for institutional reasons, such as public administration services, or because international transportation costs severely limit the volume of trade. In such cases, the import supply price and export demand price set wide bounds within which the internal price can be determined by domestic market conditions and the commodities can be viewed as effectively non-tradeable.

The distinction between internationally tradeable and non-tradeable commodities is important in determining the actual size of the expansionary effects for the two regions and for the nation. If any of the increase in demand associated with the spending on the project (ΔJ_a and ΔJ_b) or on the induced exports from Region B ($m_{ab}K_a\Delta J_a$) is for internationally tradeable commodities, this may simply produce an offsetting adjustment in the flow of international trade.[1] This will clearly be true for commodities which are traded and for which Canada is a price taker on international markets. An increase in the domestic demand for an exportable commodity will lead to a reallocation of domestic production away from the export market to the home market and Canadian exports of the commodity will fall. Similarly, an increase in the demand for a domestically produced importable commodity will produce an offsetting increase in the flow of imports to satisfy other domestic demanders of the commodity.

[1]Additional adjustments to the flow of international trade could arise if a project is a net demander or supplier of foreign exchange. This will lead to an alteration in the foreign exchange rate that could produce further expansionary effects or further displacement of domestic output. While such changes are recognized, they are likely to be so small that they can be safely ignored.

If the commodities are tradeable but not currently traded, an increase in domestic demand could push the internal price up. In this case, there would be an increase in domestic production, an increase in imports, or some mix of the two, depending on whether the internal price is pushed up to the ceiling set by the import supply price. If the commodities are traded and Canada has monopoly power over the border price, an increase in domestic demand will lead to both an increase in domestic output and to some rechanneling of output away from the export market.

While there may be some increase in domestic output of tradeable commodities, any changes that do occur are likely to be small compared with the changes for non-tradeable commodities. Indeed, the expansionary effects from the increased demand are clearly relevant only when they apply to non-tradeable commodities. Therefore, the expansionary effects are primarily associated with the extra intermediate and final non-tradeable commodities demanded by the project as inputs and demanded by Region A as imports from Region B.

Up to this point the discussion has ignored domestic transportation costs. Their inclusion complicates the identification of tradeable and non-tradeable commodities but does not change the conclusions of the analysis. Domestic transportation costs impose a natural barrier that works together with the man-made barriers of tariffs, taxes and quotas to limit international trade. In particular, domestic transportation costs serve to raise the import supply price to domestic consumers and thus provide an additional element of protection for domestic producers. These costs also serve to lower the export demand price to domestic producers and to make it more difficult for them to compete on international markets. The phenomenon, of course, is not unique to international trade but applies equally to domestic trade and leads to the regionalization of markets within a country.

The importance of domestic transportation costs for the identification of internationally tradeable commodities arises in cases where these costs are substantial so as to cause the import supply price and the export demand price to vary significantly within the nation. In such cases, it is possible for a commodity to be tradeable in some regional markets but effectively non-tradeable in others. Moreover, in a country as large as Canada, it is also possible for the same commodity to be both exportable and importable. An obvious example is coal, which is exportable in western Canada but importable in Ontario.

Domestic transportation costs and the regionalization of markets add additional complexity to the determination of a project's effects on the flow of international trade. An increase in the domestic demand for a commodity can now lead to an increase in imports, a reduction in exports, or an increase in domestic output depending on the nature of the commodity, how its border price is determined, and where the additional expenditures for it take place. The task of determining the effect of a project's commodity inputs on the flow of international trade and domestic production rests with the marketing and economic analyses in project appraisal and is more properly treated in a specialized volume on that subject.[1] However, its signifi-

[1]See Evans, John C., *A Manual for the Analysis and Appraisal of Industrial Projects in Canada*, forthcoming.

cance for the multiplier analysis is that it will lead to reduced values for ΔJ_a, and especially for ΔJ_b, since the tradeable commodity content of a project's expenditures in the rest of the nation is likely to be significant. Moreover, it also means that any induced exports for Region B ($m_{ab} K_a \Delta J_a$) are not likely to be of great importance after any adjustments have been made to remove the offsetting effects on the flow of international trade. For this reason, the expansionary effects associated with the induced exports can often be safely ignored. The discussion in the next part of this section assumes that the expansionary effects have been adjusted to take into account the offsetting effects on the flow of international trade. Hence, it assumes that they apply to the increased demand for primary inputs for a project (principally labour) and for intermediate and final non-tradeable commodities.

9.2.4 The Contractionary Effects of Displacement

The displacement of other economic activity, which serves to offset the expansionary effects of project spending in the two regions, takes place over the adjustment period, with the amount of displacement growing until it reaches its maximum value in the new equilibrium. As a result, the change in non-basic activity induced by the combined expansionary and displacement effects also varies over the adjustment period and reaches its final value only in the new equilibrium.

Any displacement that occurs in Region A will take place for the two reasons already mentioned, namely because a project is competitive with other regional firms on the output and on the input markets. However, the contractionary effects from displacement are usually smaller than the expansionary effects and the change in non-basic activity in Region A will normally be positive. This will be true both in the adjustment period and the new equilibrium, but the size of the change will differ between the two because of the different time paths for the expansionary effects and displacement.

The displacement of other activity in Region B is more complicated since it may arise from both the extra spending in B and the extra spending in A. The expansionary effects of the project spending and of the induced exports to Region A will, by themselves, increase the demand for labour in Region B. Some of this increased demand will be satisfied initially by workers who would not have been either employed or in the labour force. Some of it will also be satisfied by bidding workers away from other regional activity. Over time, the displacement of other regional activity will grow as the increased wage rates required to attract labour to the expanding firms cause more and more workers to be drawn from other uses.

The project spending in Region A will also displace activity in Region B for the two reasons previously cited for Region A. If a project's output is competitive with the output of firms in Region B, this could crowd out activity in the competing firms. A similar result could arise from the increased competition for inputs. Thus the increased demand for funds to finance a project during its construction phase will raise the rate of interest and lead to reduced spending and the displacement of other capital formation in the rest of the nation. Also, the increased demand for non-

tradeable commodity inputs in Region A will increase their prices and could lead to the displacement of output in B's firms. However, any displacement in Region B because of the increased competition for inputs will come about primarily as a result of the adjusted flows of migration between the two regions.

The increased demand for labour in Region A to support a project and the induced non-basic activity will push its unemployment rate below its long-run rate. This will affect the migration flows between the two regions as fewer workers now leave for B while more move to A. The reallocation of labour between the two regions will alter the flow of basic and non-basic spending in B compared with what it would have been in the absence of a project. When workers move, they take their unemployment insurance benefits and spending with them so that Region B loses these transfers and spending. Moreover, it also fails to gain the transfers and spending it would have gained from the workers who now remain in Region A.

The overall change in non-basic activity in B, then, is a result of the expansionary effects of the project spending and induced exports in B, and the contractionary effects of three displacement flows — the displacement in response to the expansionary effects, the competition for output, and the competition for inputs, with the latter making itself felt primarily in the adjusted flows of migration. If any positive change in non-basic activity occurs in B, it will probably arise only in the early stages of the adjustment period. As displacement grows over time (especially because of the adjusted flows of migration), any gain will disappear. The change in non-basic activity, therefore, will become negative and grow until it reaches its maximum value in the new long-run equilibrium.

The overall impact on the two regions can be summarized in the following way. The spending on a project in Region A will lead to an expansion of basic and non-basic activity in both the adjustment period and in the new long-run equilibrium. In Region B, the project spending and the induced exports will lead to an expansion in those sectors of its economy that produce this output. However, this spending will also cause a contraction in the rest of B's economy as resources are either pushed out of firms that compete with a project or bid away from other uses by the expanding sectors in B and the expanding activity in A. Therefore any expansion in Region B's non-basic sector will be temporary at most and it will disappear and become negative as the economy adjusts and finally reaches its new long-run equilibrium.

9.3 THE CHANGE IN NON-BASIC ACTIVITY FOR THE NATION

Now that both the expansionary effects of the project spending and the contractionary effects of displacement have been discussed, it is possible to consider the question posed earlier in the chapter of whether the regional non-basic activity induced by a project could be incremental for the nation as well as the region. The question will first be considered under the continued assumption that the national economy is closed to the flow of labour. This assumption will be dropped in the second part of the section where the implications of external migration will be taken into account.

9.3.1 The Change in Non-Basic Activity and Internal Migration

It was pointed out earlier that a project appraisal consists of a comparison between two cases: one where a project is undertaken, and a second, or base case, where it is not, and the region and the nation continue along their long-run growth paths. A project undertaken in a slow-growth region such as Region A will cause employment and income in that region to be greater than they otherwise would have been; but it will also cause employment and income in the rest of the nation, Region B, to be smaller than they otherwise would have been. These changes come about as resources, and especially labour resources, are reallocated between the two regions through the adjusted flows of internal migration.[1]

The migration flows, however, adjust over time rather than instantaneously, and when a project starts up, the increased employment in Region A will be supported by a lower regional unemployment rate and a higher regional participation rate. The increased regional non-basic activity is then supported initially by labour resources that otherwise would not have been employed or in the labour force. Their use requires no reduction of output elsewhere in the nation, so that the increased non-basic activity will be incremental for both the region and the nation.

As the flows of internal migration adjust over time in response to the lower unemployment rate in Region A, the labour resources supporting the increased basic and non-basic activity will change. Now more and more of the labour will come from migrants to the region and from potential migrants, workers who would have left the region in the absence of a project. The reallocation of these labour resources does displace output that would have been produced elsewhere in the absence of a project. As a result, the incremental non-basic output for the nation decreases over the adjustment period. Whether it disappears or not depends on the nature of the new long-run equilibrium that is established.

Suppose, for example, that in the new long-run equilibrium, the two regions' unemployment and labour force participation rates are identical to those that would have prevailed in the absence of a project. This would mean that all of the labour resources required to support the increased activity in Region A will come from workers who otherwise would have been in Region B. Therefore, a project will lead to a transfer of non-basic activity between the two regions. However, since the long-run unemployment rates in the two regions differ, the national unemployment rate will rise and the nation as a whole could suffer a decline in non-basic activity and national income if the reallocated workers' productivity is unchanged. That is, workers who otherwise would have worked, say, 95 percent of the time and have been unemployed for 5 per cent of the time in Region B, will now work, say, 85 percent of the time and be unemployed for 15 percent of the time in Region A. The result will be a loss in national income but not necessarily in national welfare if the reallocated workers prefer the mix of employment and unemployment in A rather than B.

[1]Capital, of course, will also be reallocated between the two regions. Yet, unlike reallocated labour, the income flow to reallocated capital need not accrue to Region A. Hence, any effect that reallocated capital may have on non-basic activity has been ignored.

If the long-run unemployment rate in A is lower in the new equilibrium and the rate in B is unchanged, any income loss to the nation would be reduced. A large project offering year-round employment could significantly affect the structure of a small slow-growth region and produce such a result. Yet if the loss in national income and non-basic activity is to be completely eliminated, the unemployment rate decrease in A must be sufficient to leave the overall national unemployment rate unchanged.

A project could also have an effect on the unemployment rate in Region B, causing it to be greater or smaller than it otherwise would have been. Given the size of Region B compared with A, only a negligible change in its unemployment rate would be required to maintain the national rate and leave national income and non-basic activity unchanged. Thus, if A's unemployment rate remains unchanged, B's rate need adjust by only a small amount to keep the national rate constant. An even smaller change or no change at all would be required if A's rate falls.

The most probable outcome is one where the two regional unemployment rates do change and are different from what they otherwise would be in the new long-run equilibrium. This is because it is most unlikely that any project, even a major one, would affect the nation's long-run and full-employment equilibrium. Therefore, in the new long-run equilibrium A's rate could be either unchanged or lower and B's rate could be either unchanged or higher, but any change in B's rate would be so small as to be unnoticeable.[1]

The discussion implies that the reallocation of labour resources between the two regions is unlikely to lead to a gain in non-basic activity for the nation because it is unlikely to alter long-run national income and employment. However, if the productivity of labour is higher on a project than in the activities from which the labour is drawn, long-run national income could rise even if long-run national employment is unchanged. While a productivity change has the potential to produce an overall gain in non-basic activity, it is not clear whether such a gain would actually be realized since the higher national income would also alter the flow of international trade and the mix of output produced by the economy. Moreover, the typical project under appraisal is viewed as a marginal one for the economy as a whole so that any productivity improvements are likely to have little effect on long-run national income. Therefore, it can be concluded that, in general, the reallocation of labour resources as a result of a project is unlikely to produce a long-run gain in non-basic activity for the nation.[2]

[1]If the relevant unemployment rate is the temporary sector rate, it is also possible for A's labour force unemployment rate to be higher with a project than without it. A project which creates temporary rather than permanent sector jobs could produce such a result. See Jenkins and Kuo, *op. cit.*, pp. 233-239.

[2]To complicate the matter even more, the increased supply produced by a project could also influence the level of non-basic activity for the nation in the new long-run equilibrium. The typical project is considered part of a region's basic sector because its output is usually exported from a region. While the commodity may be an export for a region, it could be an exportable, importable or non-traded commodity for the nation. The increased domestic supply of the commodity will have repercussions on the flow of international trade, the foreign exchange rate, the allocation of domestic resources and the mix of output produced by the national economy. These repercussions will vary with the nature of the commodity produced, but the overall result could lead to a change in the size of the nation's non-basic sector and cause it to be different from what it would have been in the absence of a project. Moreover, such a change could also lead to a change in the size of the national long-run multiplier if imported commodities now satisfy more or less domestic consumption than before. While such changes are possible, it should be noted again that they are likely to be small and therefore can usually be ignored.

While the reallocation of labour resources is unlikely to lead to a gain, a rise in Region A's long-run participation rate could produce such a result because resources that would not otherwise have been in the labour force can be used to support the extra output. Since the regional participation rate will be affected by other influences, it is possible for it to rise or fall even in the absence of a project. Therefore, the relevant comparison is between the long-run participation rate with a project and the rate that would apply in the absence of a project.

If the long-run regional participation is influenced by a project, it will be greater in the new equilibrium than it otherwise would be. It is clearly possible for a project to produce such a result if it provides employment opportunities for relatively immobile members of a region's population. An obvious example is a project that provides employment opportunities for married women in regions where such opportunities are limited by the existing productive activities and where the jobs created are not attractive to workers outside of the region. To the extent that such resources are drawn into the labour force, both a regional and national gain will occur providing the rise in the region's participation rate is not at the expense of a decline elsewhere because of the displacement of similar employment.

A national gain occurs in this case because the increase in regional basic and non-basic output requires less displacement of output elsewhere than would otherwise be true. That is, fewer regional residents will be required to remain and fewer non-residents to migrate than if the regional participation rate had not risen. While its rise has the potential to produce a long-run national gain, it is unlikely to be large since most projects normally will not have any significant effect on the long-run participation rate.

9.3.2 The Change in Non-Basic Activity and External Migration

The previous discussion specifically assumed that the nation was closed to the flow of external migration. However, if the nation is open, some of the displacement that would have been brought about by internal migration could now be offset by external migration, providing the induced external flow is over and above what would have occurred in the absence of a project.

An altered flow of external migration could come about for much the same reason as an altered flow of internal migration. The flow of internal migration previously was shown to be affected by a difference between the short-run and long-run regional unemployment rates. The flow of external migration is also affected by a difference between the two rates, but in this case it is the national and not the regional rates that are relevant. If the short-run unemployment rate is below the long-run rate, the flow of external migration will increase as fewer workers leave and more move in. While the two flows respond to similar stimuli, the external flow responds much more slowly than the internal one because the costs of external migration are much greater than those for internal migration and because there are barriers to external migration that do not exist for internal migration. Therefore, while the flow of external migration can be viewed as one of the regulators of the long-run unemployment rate, it operates much more slowly than the internal flow.

If a project is to cause the flow of external migration to be greater than it otherwise would be, it must lower the nation's short-run unemployment rate. It is most unlikely that any project, even a major one, would have such an effect but it is possible for a project to lower the national unemployment rate for particular labour skills. Such cases are not uncommon and if a project does lead to an enhanced inflow of labour from other countries it is often due to the direct recruitment of particular labour skills.

The possibility that external migration might offset the displacement caused by the increased competition for labour is usually ignored in most project appraisals. Since a project is unlikely to affect the overall short-run national unemployment rate, this would seem the proper way to treat external migration. But if it can be clearly shown to have an effect on the flow of external migration, say, through direct recruitment, some of the displacement that would have occurred will be offset.

The increased inflow of external migration will produce results similar to an increase in the regional participation rate in that some of the labour supply required to support the increase in regional basic activity will come from workers who would not otherwise have been in the labour force. The increased supply of labour will lead to a smaller flow of internal migration and less displacement in the rest of the nation. Therefore, an enhanced flow of external migration could produce a long-run increase in non-basic activity for the nation.

9.4 HOW TO ESTIMATE THE INCREMENTAL NON-BASIC ACTIVITY

The last section showed that it was possible for both the nation and the region to experience an increase in non-basic activity during the adjustment period because some of the labour resources used to support the change would otherwise not have been employed or been in the labour force. Moreover, a net increase could persist in the long run if a project leads to an increase in the long-run regional participation rate or if it induces an increase in external migration.

This section provides some comments to guide the analyst in preparing estimates of incremental non-basic activity for a project appraisal. All of the comments deal with the questions of how to define the relevant multiplicand and how to determine the relevant multiplier. However, the broader questions of how to estimate the social opportunity cost of labour or the welfare gain to the nation (if any) will not be considered since these are more properly treated in a specialized volume on project appraisal.[1]

9.4.1 The Estimates for the Region

The incremental non-basic activity for the nation can be estimated by first determining the incremental non-basic activity for the region. The changes elsewhere in

[1]For a discussion of these questions see Evans, John C., *op. cit.*

the nation are then accommodated in an additional set of estimates or in the social opportunity cost of the labour required to support the region's incremental non-basic activity. The regional estimates are based on the difference between what non-basic activity would be with a project in place and what it would have been without a project. Moreover, since a project appraisal requires annual estimates, they will have to be made for each year over the life of a project. Estimating these annual changes is both complex and troublesome, and they can really be determined only as part of a full simulation of a project's effects on a region. The point will become obvious after the problems of preparing the estimates have been set out for the two phases of a project.

9.4.2 The Long-Run Change in the Operating Phase

In the absence of a project, the regional economy can be viewed as moving along some long-run equilibrium growth path. In this equilibrium there will be some long-run unemployment and participation rate and flows of in-migration and out-migration that are just sufficient to maintain the long-run unemployment rate. Moreover, the economy will have flows of basic employment, unemployment, and non-basic employment and flows of basic and non-basic income which determine the long-run multipliers. When a project is imposed on the region, it will disturb the long-run equilibrium growth path and produce a short-run adjustment period that will eventually lead to a new and different long-run equilibrium growth path.

The flow of non-basic activity (employment and income) will be different in the new long-run equilibrium and it is possible to estimate this difference if the change in basic activity between the two cases and the relevant multiplier that applies to the change in basic activity can be determined. The change in basic activity depends on the direct and indirect project activity, the level of displacement of other regional activity, and the long-run unemployment rate that prevails in the two cases. If displacement is ignored for the time being, the direct and indirect project employment and income will make up part of the change in basic activity between the two cases. The rest of the change will depend on the difference in the level of unemployment and unemployment insurance benefit payments and they in turn will depend on what happens to the long-run unemployment rate. For example, if the unemployment rate is identical in the two cases, the level of unemployment will be greater with a project than without it because the size of the labour force will be greater. Therefore, both basic employment and unemployment will be greater with a project than without it.

The selection of the relevant multiplier depends on the source of the labour that supports the change in the region's labour force. If the participation rate and the unemployment rate are identical in the two cases, any change in the labour force would have to come about because fewer workers left the region and more moved in than would have occurred in the absence of a project. The long-run differences in the size of the labour force and in the flows of basic employment, unemployment and non-basic employment, therefore, will be supported by workers who would have been employed or unemployed elsewhere, and the relevant multiplier to apply is the pure migrant labour multiplier.

This multiplier is appropriate because the change in basic activity (employment and unemployment) between the two cases is associated with workers who either would have moved to or remained in the region as a result of a project. The inflow of workers from elsewhere will lead to a first-round expansion of non-basic activity typical of that for migrants and captured by the migrant labour coefficient in the multiplier. Workers who remain in the region produce a similar effect. In the absence of a project they would have left and caused a first-round change in non-basic activity that is identical to but in the opposite direction to that of the migrants. Since they now remain, non-basic activity will be greater than it otherwise would have been and the first-round difference is also captured by the migrant labour coefficient. The migrant coefficient applies to the subsequent rounds as well since all of the change in non-basic activity will be supported by either migrants or potential migrants.

The selection of the relevant multiplier highlights one of the important differences between the multiplier estimates for project appraisal and those for regional impact analysis. In the latter analysis, potential migrants are treated as local labour and the smaller local labour coefficient is used for the first round of the multiplier. The multipliers differ in the two types of analysis because the comparisons made in them are different. Regional impact analysis involves a comparison between the existing level of activity (the initial equilibrium) and the level that would prevail after a project is in place and all of the repercussions on the regional economy have worked themselves out (the final equilibrium). Project appraisal, on the other hand, compares the equilibrium that would occur after a project is in place and one that would have occurred without it. In this comparison the change in economic activity will be greater than in the previous one because it picks up the gain to the region by avoiding a loss from the migration of regional residents who otherwise would have left the region. Since these workers are now retained, regional employment and income will be greater than they otherwise would have been.

A numerical example may help clarify the difference between the two analyses. Assume that a project having 100 man-years of employment is to be undertaken in a region with an equilibrium unemployment rate of 18.2 percent.[1] Also, assume that all of the new basic sector jobs are expected to be ultimately filled by migrants while the rest of the change in the labour force will ultimately consist of potential migrants. The coefficients for the employment multipliers are $h^m = 0.5$ and $h^l = 0.333$. Since unemployment will increase in the example, an unemployment multiplier will also be needed to pick up the effects of the change in unemployment insurance benefits on the non-basic sector.[2] This will be done by weighting the first round of the employment coefficients by 0.5, so that the values for the unemployment coefficients are $h_u^m = 0.25$ and $h_u^l = 0.167$. The subsequent-rounds coefficients will have their full value because they apply only to employed workers.

[1] An assumption, or better, prediction about the unemployment rate is not usually made in regional impact analysis because the concern is with the change in basic activity and the resulting change in non-basic activity. Clearly, the analysis would be improved if such a prediction were included since a change in the level of unemployment will also affect the level of non-basic activity.

[2] See Section 8.4.2 for a discussion of the employment and unemployment multipliers.

Table 9-1 shows the estimates of the change in the labour force measures for the two types of analysis. The data in column 1 for project appraisal show larger estimates for the change in the labour force, unemployment and non-basic employment as well as for the number of potential migrants retained in the region. The estimates for project appraisal include the full gains to the region of retaining the potential migrants compared with what would have been true if they had left. Since such gains are not taken into account in regional impact analysis, it understates the regional employment gains from a project.

Table 9-1
Example of Labour Market Changes for
Project Appraisal and Regional Impact Analysis

Labour Market Changes	Project Appraisal[a]	Regional Impact Analysis[b]
Change in Labour Force (ΔL)	+275	+226
Change in Basic Employment (ΔB)	+100	+100
Change in Unemployment (ΔU)	+ 50	+ 41
Change in Non-Basic Employment (ΔN)	+125	+ 85
Change in In-Migration	+100	+100
Change in Out-Migration	+175	+126

[a]For project appraisal, the long-run multipliers are 2.0 for the change in basic employment and 1.5 for the change in unemployment. The values for ΔU, ΔN and ΔL were obtained from

$$\Delta B + \Delta U + \Delta N = \Delta L \quad (1),$$
$$\Delta U = .182\,\Delta L \quad (2), \text{ and}$$
$$\Delta L = 2.0\,\Delta B + 1.5\,\Delta U \quad (3).$$

[b]For regional impact analysis, the mixed multipliers of 1.75 for the change in basic employment and 1.25 for the change in unemployment are used. The values for ΔU, ΔN and ΔL were obtained from

$$\Delta B + \Delta U + \Delta N = \Delta L \quad (1),$$
$$\Delta U = .182\,\Delta L \quad (2), \text{ and}$$
$$\Delta L = 1.75\,\Delta B + 1.25\,\Delta U \quad (3).$$

9.4.3 The Adjustment Period in the Operating Phase

The numerical example in Table 9-1 shows that the long-run change in regional non-basic employment (or income) required for a project appraisal can be estimated given the change in basic activity, the values of the long-run multipliers, and assumptions about the long-run unemployment and participation rates for the two cases. However, the long-run change is only part of what is required for a project appraisal. The changes that take place between the time a project starts up and the

time the new long-run equilibrium is established are also required, and they have to be estimated year by year over the adjustment period.

The determination of the size of the multiplicand and the selection of the relevant multipliers for the adjustment period are more complex than for the long-run period. Since the estimates are to be made on an annual basis, the multiplicand will consist of the change in basic employment and unemployment activity compared with the base case for each year of the adjustment period. Depending on the type of multipliers used, these changes are measured in man-years of employment and unemployment or in the income associated with each type of basic sector activity.

If the displacement of other regional activity is again ignored, part of the change in basic activity will consist of the annual estimates of direct and indirect project employment (or income). The change in unemployment (or unemployment income) is more difficult to estimate and depends on how the labour force and the unemployment rate change over the adjustment period. These in turn depend on the regional multiplier and on how the regional participation rate and the flows of migration adjust as the unemployment rate changes. Indeed, because of the interrelationships among the labour market variables, the change in unemployment can really be determined only as part of a full simulation of a project's effects on the regional economy. The point will be illustrated shortly with a simple numerical example.

The selection of the multiplier again will depend on the source of the labour that supports the change in the regional labour supply. If the long-run unemployment and participation rates remain unchanged in the two cases, any change in the regional labour supply must be supported by a reduced outflow of labour and an increased inflow of labour. The migration flows, however, adjust over time so that in the early part of the adjustment period only part of the change in basic employment, unemployment and non-basic employment will come about through the adjusted flows of migration. Indeed, when a project starts up, the labour required to support the extra basic and non-basic output will come primarily from a reduced unemployment rate and an increased participation rate. Over time, the adjusted flows of migration will cause the mix of local and migrant and potential migrant labour to change. Therefore it is only in the long run, after the adjustment process has been completed, that the changed labour force will include just migrant and potential migrant labour.

The changing mix of local and migrant and potential migrant labour means that the relevant multiplier for the analysis will also change over the adjustment period. Again, this is because the multiplier effects on the region vary according to whether local labour or migrant and potential migrant labour support the extra basic and non-basic activity. Since most of the labour in the early years will include workers who would have been unemployed and who would have remained in the region, and new entrants into the labour force who also would have remained in the region, the multiplier effects will be determined primarily by the spending behaviour of existing regional residents. That is, the relevant coefficients for both the first-round and the subsequent-rounds effects will be close to the coefficient for local labour. Over time, the relevant coefficients will grow in size as the share of migrant and potential migrant labour grows until in long-run equilibrium they will become equal to the migrant labour coefficient, and the pure migrant labour multiplier will apply. Therefore, in

any one year, the first-round and subsequent-rounds coefficients will be some weighted value based on the mix of local and migrant and potential migrant labour in basic and non-basic activity.

The fact that the multipliers are to be used in an adjustment period analysis poses another problem in the selection of the relevant multipliers. The adjustment period involves dynamic change that takes place from period to period. The type of multipliers appropriate for such an analysis are dynamic multipliers that also measure change from period to period. Yet the multipliers developed in this Guide are static, not dynamic, and they measure the total or final change over the whole period after all the adjustments have worked themselves out.

This problem, while troublesome, can be overcome in two ways. The first and simplest is to assume that the multiplier effects reach their full value in the same period as the change in basic activity, the one-year period employed in the analysis. Such an assumption is not unreasonable for the pure local labour multiplier since the short-run multiplier effects probably will work themselves out relatively quickly. However, the assumption is less reasonable for the pure migrant labour multiplier and the mixed multipliers. The changes associated with migrant labour will probably take place over a longer period of time and if they are compressed into one year they will tend to overstate the early year's change in non-basic activity compared with what would actually take place.

A second and preferred way is to adjust the multipliers to spread the changes out over time. Yet to do this requires some evidence on how long the period of adjustment will be. The literature on the economic base model, and indeed on other types of regional multipliers, provides little guidance on this matter. Again, a reasonable approach might be to use a one-year time period for the local labour coefficient[1]. However, the appropriate time period for the migrant labour coefficient will depend on how long it takes to add to or run down the non-basic capacity associated with migrants or potential migrants and thus increase or decrease the flow of non-basic employment and income. For most projects, a three-year period would seem more than ample to adjust the necessary capacity in housing, commercial activity and public services, while for major projects, a longer period of up to five years may be more appropriate given the substantial changes in local service capacity that may be required.[2]

If the migrant labour coefficient is to be adjusted, it is not unreasonable to assume that the largest share of the total effects will be felt in the year that the migrant moves in or the potential migrant does not leave. In the following years, the additional effects

[1]Empirical support for a one-year period can be found in Sasaki, Kyohei, "Military Expenditures and the Employment Multiplier in Hawaii", *Review of Economics and Statistics*, Vol. XLV (1963), pp. 298-304, and in Mattila, John, "A Metropolitan Income Determination Model and the Estimation of Metropolitan Income Multipliers", *Journal of Regional Science*, Vol. 13 (1973), pp. 1-16.

[2]There does not appear to be any empirical evidence on the time period for the long-run coefficient and most authors simply assume a time period. For example, Mishan and Needleman use a two-year period, in Mishan, E.J., and Needleman, L., "Immigration: Some Economic Effects", *Lloyds Bank Review*, July, 1966. However, Archibald used a three-year period, in Archibald, G.C., " The Regional Multiplier Effects in the U.K.", *Oxford Economic Papers*, Vol. 19 (1967), pp. 24-45.

are likely to fall off at a decreasing rate. Hence, the assumption that 60 percent of the effects are felt in the first year, 90 percent in the second, and the full 100 percent in the third might represent a useful distribution for a three-year period. The adjusted coefficients for these lagged effects can be determined by applying the suggested weighted shares to the non-basic activity associated with the pure migrant labour multiplier. For example, the lagged multipliers that correspond to the labour income multiplier of 2.38 obtained in section 8.4.1 would be $1 + 0.6\ (1.38) = 1.83$ for the first year; $1 + 0.9\ (1.38) = 2.24$ for the second year; and 2.38 for the third year. The migrant labour income coefficients would then be 0.45, 0.55 and 0.58, respectively.

It is also possible to vary the size of the following years' changes if the analyst thinks this is appropriate because of the nature of the project, the region, and the induced non-basic activity. However, no matter what distribution is selected, the first year's effects should not be smaller than the local labour effects since it is most unreasonable to assume that migrants and potential migrants would have a smaller first-year effect on the region's non-basic sector than would local labour. The suggested adjustment process is admittedly crude, but without hard evidence on the likely period of change, little else can really be done.

Before this part of the section is concluded, it would be useful to provide a short example to illustrate some of the points made. The example will be similar to the one in Table 9-1 in that it again will be a project with 100 man-years of basic employment and it will lead to the same long-run equilibrium. However, since the interest now is in the time path of the employment change during the adjustment period, it is also necessary to specify the year-by-year changes. To simplify the example, it will be assumed that the extra basic employment is added in the first year and remains constant thereafter. The region again will be assumed to have a long-run unemployment rate of 18.2 percent. The multipliers are based on the two coefficients h^m and h^l, with h^m set at 0.5 and h^l set at 0.333. For the sake of simplicity, the effects associated with each of these coefficients are assumed to occur in the same year as the change in basic activity so that the coefficient h^m will not be adjusted as was suggested previously. The two coefficients are used for both the change in employment and income. However, the first-round coefficients for unemployment activity again are set at half the value for employment activity in the unemployment multipliers. The same effects are incorporated into the income estimates by taking the income flow to unemployed workers as half the flow to employed workers.

In the example it is also necessary to specify how the migration flows adjust each year. This is done by assuming a five-year adjustment period with one-fifth of the ultimate change in the labour force occurring in each year. Therefore, each year's reduced net outflow consists of 55 migrants and potential migrants. This labour is assumed to flow into basic employment, unemployment, and non-basic employment in proportion to the share of each type of labour force activity in the final equilibrium. Thus 20 basic, 25 non-basic and 10 unemployed workers are added to the labour force each year. The rest of the labour supply required to support the change in basic and non-basic employment is assumed to come from the local unemployed. Finally, to simplify the example, it has also been assumed that no change occurs in

the regional participation rate over the adjustment period. The subsequent discussion will consider how such a change could affect the results of the example.

While a good many of the adjustments have either been specified or assumed away, the important changes in non-basic activity are determined in the model as are the values of the multipliers.[1] Table 9-2 shows the time path of change in the labour force variables and in the flows of regional income compared with the base case. The multipliers for each year, also shown in the table, depend on the annual mix of local and non-local (migrant and potential migrant) labour in basic employment, unemployment and non-basic employment. This annual mix of local and non-local labour is determined in part by the assumed adjusted flows of migration and in part by the way unemployment and non-basic employment adjust because of the multipliers. The multiplier values for employment and income rise each year as expected until they reach their maximum values in the fifth year. The unemployment multiplier, however, shows a peculiar trend because it is determined in most years by a mix of negative local and positive non-local unemployment.

Without a simple simulation model, it would not have been possible to estimate the change in non-basic activity over the adjustment period. If the simple model had been made more sophisticated, both the size and the time path of the change in non-basic activity would have been altered. For example, suppose that changes in the regional participation rate had been included by linking this rate to the changes in the regional unemployment rate. With the assumed flows of migration unchanged, the participation rate would have risen in the initial year and then fallen back over time to its long-run rate in the final year. This would have caused the unemployment rate and the level of unemployment to be greater in the earlier years than in the example, so that the change in non-basic activity would also have been greater. Similarly, if the multiplier effects for migrants and potential migrants had been spread out over time as suggested previously, the change in non-basic activity would have been smaller in the early years. More importantly, the adjustment period would have had to be longer than the assumed one since the effects on the region would have continued past the five-year period. Finally, if the migration flows were not assumed but rather linked to the changes in the unemployment rate, this would have altered

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[1]The model used took the following form:

$$\Delta L = \Delta B + \Delta U + \Delta N \quad (1),$$

$$\Delta B = \Delta B_{n1} + \Delta B_{l} \quad (2),$$

$$\Delta U = \Delta U_{n1} + \Delta U_{l} \quad (3),$$

$$\Delta N = \Delta N_{n1} + \Delta N_{l} \quad (4),$$

$$\Delta N = \frac{\Delta B_{n1}h^{m} + \Delta B_{l}h^{l} + 0.5\,\Delta U_{n1}h^{m} + 0.5\,\Delta U_{l}h^{l}}{1 - h^{s}} \quad (5),$$

$$h^{s} = \frac{\Delta N_{n1}h^{m}}{\Delta N} + \frac{\Delta N_{l}h^{l}}{\Delta N} \quad (6),$$

where B, N, U, and L are basic employment, non-basic employment, unemployment, and the labour force, respectively, and the subscripts 1 and n1 stand for local and non-local (migrant and potential migrant) labour, and where h^s is the subsequent-rounds coefficient of the multiplier. The values for the income flows were obtained from the labour market flows by assuming an average basic and non-basic employment income of $10 000 and an average unemployment insurance benefit of $5 000.

Table 9-2
An Example of the Regional Labour Force and Income Changes Brought About by a Project Compared With a Base Case, and the Resulting Values of the Multipliers

Labour Force or Income Flows	Base Case	Change From Base Case				
		Year 1	Year 2	Year 3	Year 4	Year 5
		(man-years)				
Labour Force	2 750	+55	+110	+165	+220	+275
Basic Employment	1 000	+100	+100	+100	+100	+100
Unemployment	500	−87	−53	−19	+15	+50
Non-Basic Employment	1 250	+42	+63	+84	+105	+125
Migration Flows	−100	+55	+55	+55	+55	+55
Multiplier (Employment/Unemployment)	2.00/1.50	1.65/1.28	1.75/1.23	1.84/1.06	1.92/1.87	2.00/1.50
		(thousands of dollars)				
Regional Income	25 000	+985	+1 365	+1 745	+2 125	+2 500
Basic Employment Income	10 000	+1 000	+1 000	+1 000	+1 000	+1 000
Unemployment Income	2 500	−435	−265	−95	+75	+500
Non-Basic Employment Income	12 500	+420	+630	+840	+1 050	+1 250
Multiplier	2.00	1.74	1.86	1.93	1.98	2.00

the time path of the migration flows, the values of the multipliers, and the size and the time path of the change in unemployment and non-basic activity. It is clear, then, that the adjustment period changes are complex and that the changes in non-basic activity can only really be determined through the inclusion of the interrelationships among the labour market variables and the multipliers in a full simulation of a project's effects on the regional economy.

9.4.4 Including Displacement and Long-Run Participation Rate Changes

The discussion up to this point has ignored the possibility that a project may displace other regional activity or raise the long-run regional participation rate. Yet both of these possibilities have to be recognized if complete estimates of incremental regional non-basic activity are to be made.

The displacement of other regional activity can be accommodated in the analysis in a relatively simple manner. If any displacement is expected because of the increased competition on the output market, estimates of the time path of this displacement, in man-years of local employment or the wage bill lost, will enter the analysis as a negative flow of basic activity. Any expected displacement from the increased competition for inputs will enter it in a similar way. These negative flows will cause the overall change in basic activity to be smaller than the activity associated with a project and the long-run change in non-basic activity will therefore be smaller than if no displacement had occurred. However, the time path of displacement will influence the unemployment rate, the participation rate, the flows of migration, and the values of the multipliers. Thus the displacement of other regional activity will also affect the size and time path of the change in non-basic activity in the adjustment period.

If a project leads to a rise in the long-run participation rate, some of the long-run change in the regional labour force will include local labour. In this case, the long-run multiplier appropriate to local labour is a mixed multiplier with a first-round local labour coefficient and a subsequent-rounds migrant labour coefficient. The former coefficient is used because the local labour is usually assumed to be associated with a project. The change in non-basic activity, however, will probably still be supported by only migrant and potential migrant labour and this dictates the use of the migrant labour coefficient for the subsequent rounds.

During the adjustment period, a project will lead to a larger change in the short-run participation rate than would otherwise be true. As a result, the flow of migrant and potential migrant labour required to support the change in basic and non-basic employment will be smaller and local labour will make up a larger share of the change in unemployment. Therefore, the multiplier values will also be affected. They will be lower than they would be otherwise and they will reach a final value in long-run equilibrium that is below that of the pure migrant multiplier to reflect the changed labour supply that now includes both local and non-local labour.

9.4.5 The Construction Phase

The analysis of the construction phase again involves a comparison of two cases — one with the phase and a second, or base case, without it where the regional economy is assumed to continue along its long-run equilibrium growth path. The start-up of the construction phase will disturb the regional economy's long-run equilibrium and lead to a period of adjustment which includes the repercussions of the change in basic sector activity as construction starts up, rises to a peak, and then declines as it nears completion. Once the construction phase ends, the regional economy will again return to its long-run equilibrium growth path. Therefore, any incremental non-basic activity in this phase will occur only during the adjustment period and it will disappear when the phase ends.

The change in basic activity in any year of the adjustment period is determined by the three changes mentioned previously — the change in direct and indirect construction activity, the change in unemployment activity as the labour market adjusts, and the change in other regional activity from an displacement in the construction phase. The multiplier appropriate to these basic sector changes is determined by the mix of local and non-local labour required to support each year's change in basic and non-basic activity. This mix will depend on how the unemployment rate, the participation rate and the flows of migration respond during the adjustment period. Therefore, the values of the multiplier and the resulting size and time path of the change in non-basic activity can again only really be determined as part of a full simulation of the construction phase's effects on the regional economy.

There are significant differences in the way the change in basic activity is determined and the way the coefficients are selected for the multiplier between the construction and operating phases of a project. They are due to two important characteristics of the construction phase which affect the treatment of migrant labour. The first is its short duration in comparison with the operating phase, while the second is that the migration flows adjust in both directions and cause the labour force to grow as construction moves to its peak and then to decline as it moves toward completion.

Since the migration flows adjust in both directions, any migrant labour attracted to the region during the construction phase will leave once the phase ends. Therefore, unlike the operating phase where migrants become permanent regional residents, during the construction phase they are only temporary residents. Given the relatively short duration of their stay in the region, the migrants are likely to have only a small effect on non-basic activity because most of their income and spending will flow out to their home regions. It was suggested in Chapter 3 that if the migrants' impact on the region's non-basic sector is not to be overstated, their employment and income should be adjusted. This can be done for employment by deriving an employment equivalent measure determined by the regional employment directly related to their spending. A similar approach for income would mean an adjustment to the migrants' wage bill to produce a measure of the regional income directly generated by their spending. Both procedures would produce a coefficient that could then be used to adjust the employment and income flows for the migrants.

The employment equivalent and income equivalent coefficients can also be used to adjust the annual changes in basic activity to produce a lower and therefore more satisfactory multiplicand for the analysis. The adjustment would apply to the direct and indirect construction activity since it would involve migrant as well as potential migrant and local labour. It would also apply to the change in unemployment activity because it too would involve all three types of labour. However, no adjustment would be required for any regional activity displaced in the construction phase because only potential migrant and local labour would be involved.

The coefficients for the first-round effect of the multiplier are again related to the type of labour required to support the change in basic activity. For local labour, the local labour coefficient is used because this labour would have remained in the region in the absence of a project. Potential migrant labour produces a gain for the region since this labour is retained in the region longer than it otherwise would be and the size of the gain is directly related to how long the potential migrants remain. Hence the migrant labour coefficient would appear to be the appropriate one, with its effects spread over a three-year or longer period depending on the size of the project. However, since most construction phases are quite short, often no longer than a year, only the first year's value of the lagged coefficient will normally be used for potential migrants.

The regional gain from the migrants is also a function of time because the longer they stay, the more they will become integrated into the local economy and the greater will be their impact on the region's non-basic sector. This increased integration will be reflected in two ways. First, if their stay is expected to be long, the migrants are likely to take up a more permanent residence, by moving their families into the region, for example. The values for the employment equivalent and income equivalent coefficients, therefore, will tend to rise with the length of their stay in the region. Second, the longer they stay, the greater will be their demand for non-basic capacity. Hence, the value of the first-round coefficient will also rise as their stay lengthens. This suggests that the migrants should be treated in the same way as the potential migrants, with the migrant labour coefficient spread over a three-year or longer period being applied to the employment equivalent and income equivalent measures. It should be noted, however, that this approach is valid only if the migrants remain in the region continuously during the construction phase. Migrants who come in during the construction season and leave once it ends will not have a continuous presence in the region. In this case, only the first year's value of the lagged coefficient would apply to the employment equivalent and income equivalent measures.

The value of the coefficient for the subsequent-rounds effects depends on the mix of migrant, potential migrant and local labour supporting the change in non-basic activity each year. For local labour, the local labour coefficient is appropriate, while for potential migrant labour, the migrant labour coefficient spread over three years or longer should be used. The migrant labour coefficient should also be used for migrant labour, but it will again have to be adjusted to reflect the employment equivalent and income equivalent effects of migrant labour. This is done by applying the two equivalent coefficients to the income or employment coefficient h^m, with h^m spread over three years or longer. For example, assume that a three-year period is

appropriate and that the values of the income or employment equivalent coefficients are 0.10, 0.30 and 0.70 for the first, second and third years, respectively. The values of the multiplier coefficients are then 0.10 h^{m1} in the first year, 0.30 h^{m2} in the second year, and 0.70 h^{m3} in the third and subsequent years of the construction phase, where h^{m1}, h^{m2} and h^{m3} represent the values of the lagged coefficients in the first, second and third years.

9.4.6 Summary of the Estimates for the Region

Before the estimates for the nation are considered, it would be useful to summarize briefly what has already been said about the estimates of incremental regional non-basic activity.

In the operating phase, the relevant multiplicand is measured by the difference between the level of basic sector activity with a project and the level that would have prevailed in the absence of a project. The multiplicand, therefore, consists of three flows of regional basic activity:

1. the direct and indirect activity associated with non-tradeable project inputs;
2. the activity displaced by a project; and
3. the changed flow of unemployment activity from the labour market adjustments brought about by a project.

The first two flows are either estimated or obtained by the analyst while the third is usually determined as part of a simulation of a project's effects on the regional labour market.

The multiplier that applies to each year's multiplicand is determined by the two types of labour that account for the extra basic and non-basic sector employment (or income) and the changed flow of basic sector unemployment (or unemployment insurance benefits), namely local and migrant and potential migrant labour. This is because the first-round and the subsequent-rounds coefficients in the multipliers are both weighted averages which depend on the mix of the two types of labour in the changed basic and non-basic activity and on the coefficients used for each type of labour.

The coefficient h^l is used for local labour with the multiplier effects assumed to be felt in the same year as the change in basic activity, while the coefficient h^m is used for migrant and potential migrant labour with the effects spread over a three-year period or longer. The value of the first-round coefficient depends on the mix of the two types of labour that account for each year's change in basic employment and unemployment activity. Similarly, the value of the subsequent-rounds coefficient depends on the mix of the two types of labour that account for each year's change in non-basic activity. Since the mix of the two types of labour in the changed basic and non-basic activity depends on how the regional labour market adjusts as a result

of a project, the value for each year's multipliers can only really be determined as part of a full simulation of a project's effects on the region.

The same three flows of altered basic sector activity make up the multiplicand during the construction phase. However, unlike the operating phase where the multiplicand is positive in both the adjustment period and the new long-run equilibrium, during the construction phase it is positive in the adjustment period but zero in long-run equilibrium. Thus any incremental non-basic activity during this phase occurs only in the adjustment period.

The relatively short duration of the typical construction phase has an important bearing on the coefficients for the types of labour required to support the change in regional activity. For local labour, the coefficient h^1 is still relevant, with the effects felt in the same year as the change in basic activity. The coefficient h^m spread over a three-year or longer period still applies as well for potential migrant labour. However, the coefficient h^m spread over a three-year or longer period for migrant labour has to be adjusted to reflect the probable effect of the migrant's presence on the region's non-basic sector. This is done through the use of the income or employment equivalent coefficients discussed in Chapter Three. Given the coefficients for the different types of labour, the multipliers for each year's multiplicand again depend on the mix of the types of labour accounting for each year's change in regional activity. That is, both the first-round and the subsequent-rounds coefficients are weighted averages with their values determined by the coefficients for the different types of labour and the mix of the different types of labour that account for the change in basic employment and unemployment activity and non-basic activity in each year.

The usefulness of a simulation analysis to determine the incremental regional non-basic activity has been stressed repeatedly throughout the preceding discussion. It is recognized, however, that the analyst may not be able to carry out such a simulation because of a lack of time or because all of the required data are not available. It is possible to estimate the incremental non-basic activity without a simulation analysis if some simplifying assumptions are made about the labour market changes in the adjustment period. Yet even with these assumptions, the estimating procedure remains complex and tedious given the numerous calculations that are usually necessary. Since the topic may not be of interest to all readers, the discussion of the procedure has been relegated to an Appendix of this Chapter.

9.5 THE CHANGES FOR THE REST OF THE NATION

In contrast to the extended discussion of the changes in non-basic activity for the region, the comments on the changes for the rest of the nation will be quite brief. This truncated treatment is due in part to the troublesome problems of measuring the relevant multiplicand for the rest of the nation and obtaining the multiplier estimates to apply to each year's multiplicand. A more important reason is that it is not really necessary to estimate the changes in non-basic activity directly since these changes, or at least a large share of them, will automatically be incorporated in a project appraisal as part of the social opportunity cost of labour. Each of these points

will be considered in turn, beginning with the problems of measuring the relevant multiplicand.

In both phases of a project, each year's multiplicand will include the changed activity from:

1. the increased exports of non-tradeable intermediate and final commodities demanded by a project and induced by the increased incomes in the region;

2. the displacement in firms that are competitive with a project on the output market;

3. the displacement in firms that are competitive with a project on the input markets; and

4. the altered flow of unemployment and unemployment insurance benefits from the labour market adjustments in the rest of the nation.

Each of these components is difficult to measure but the measurement problem is made even more complex because the components are interrelated. For example, the increased demand for non-tradeable commodities could raise their prices and crowd out other demanders.[1] If the commodities are inputs for other firms, this will displace other activity in the rest of the nation. Moreover, the increased output of non-tradeable commodities will increase the demand for inputs, and especially labour, to produce the extra output. The initial effect will be on the flow of unemployment and unemployment insurance benefits; however, over time the increased competition will draw labour away from its alternative uses and displace other activity in the rest of the nation.

The displacement in firms that are competitive with a project on the output market will also affect the flow of unemployment and unemployment insurance benefits in the rest of the nation. The increased competition for financing and for labour by a project will have a similar effect. During the construction phase, the financing of a project will raise the interest rate and crowd out some capital formation in the rest of the nation. During both phases of a project, the increased demand for labour will alter the flow of migration between the region and the rest of the nation. When workers leave or fail to move in, the rest of the nation suffers a loss of unemployment insurance benefits and experiences a decline in the size of its labour force compared with what would have been true in the absence of a project.

It is clear from this brief summary that any attempt to estimate the relevant multiplicand would be a formidable task and that it would require a complex simu-

[1]Measuring the extra exports is itself a problem. Part of the extra exports involves the project spending on non-tradeable commodities in the rest of the nation and this could be obtained from the economic analysis for a project. However, the other part involves the induced non-tradeable imports for the region and this depends on the propensities to import from the rest of the nation by commodity type. The multipliers developed earlier do not provide such propensities so that any estimates will of necessity have to be extremely crude.

lation analysis if the labour market adjustments are to be fully taken into account. To add to these difficulties, a new set of multipliers would be required. Since an economic base framework is not really appropriate for a region as large as the rest of the nation, an alternative such as the Keynesian model would have to be used.

The problems of estimating the changes in non-basic, or better induced activity, in the rest of the nation means that it is difficult to include them in a project appraisal in the same way as the regional changes. It was noted in section 9.2.4 that the changes in induced activity for the rest of the nation will be negative in most or all of the adjustment period and in the new long-run equilibrium. Any expansionary effects from the extra exports will tend to be small since tradeable commodities will usually account for a significant share of both the project spending and the extra regional spending in the rest of the nation. Moreover, if any overall gains in induced activity should occur, they will quickly be offset by the rising flow of displacement.

The reduced activity in the rest of the nation permits a transfer of resources, and especially labour resources, to support the increased basic and non-basic activity in the region. This transfer, of course, takes place through the adjusted flows of migration so that the primary reason for the decline in induced activity in the rest of the nation is the increased competition for labour resources.

In project appraisal, the value of the transferred activity, or at least a large share of it, is included in the analysis as part of the social opportunity cost of migrant and potential migrant workers. The social opportunity cost of this labour, which is subtracted from the extra regional labour income, takes into account the income lost in the rest of the nation because the migrants leave or the potential migrants do not move to the rest of the nation. Therefore, the social opportunity cost of the migrant and potential migrant workers filling the new non-basic regional jobs will reflect the value of the lost induced activity in the rest of the nation. Also, since displacement because of the competition for labour is the only reason for the long-run decline in induced activity in the rest of the nation, the long-run change in induced activity for the nation as a whole will be included in the analysis.

While the social opportunity cost of migrant and potential migrant non-basic workers provides a reasonably satisfactory measure of the long-run loss in induced activity for the rest of the nation, it is a less satisfactory measure for the adjustment period. The competition for labour represents just one of the reasons for the change in induced activity during the adjustment period. Also, the migration flows take place over time so that this type of displacement will be more important in the later rather than the earlier years of a project. The social opportunity cost of migrant and potential migrant workers will, then, likely understate the true change in induced activity for the rest of the nation in the early years of a project. In a project appraisal this will lead to some overstatement of the secondary benefits from a project. The only way to remedy the problem is with a full multiplier analysis for the rest of the nation, but given the difficulties associated with such an analysis, it is not recommended. In any case, the problem is not really a serious one, since if a project is not able to produce a positive net social benefit under such generous treatment, it is not likely to be a candidate for assistance.

APPENDIX TO CHAPTER NINE

HOW TO ESTIMATE THE INCREMENTAL REGIONAL NON-BASIC ACTIVITY WITHOUT RECOURSE TO A SIMULATION ANALYSIS

Chapter Nine stressed that the time path of incremental regional non-basic activity could only really be determined from a full simulation of a project's effects on the regional economy. The analyst, however, may have neither the time nor the information to undertake such a simulation and some alternative approach will be sought. This Appendix provides an example of such an alternative approach.

The suggested approach has the merit of being able to capture the lagged response of non-basic activity when migrant and potential migrant labour are involved. It is also able to provide estimates of the change in non-basic activity induced by the change in regional unemployment when a project is introduced into a region. Yet the approach has two major defects as well. First, it can be extremely tedious, especially for complex projects, and this opens up the possibility of errors being made because of the numerous calculations. Second, it includes some simplifying assumptions which cause the dynamic aspects of change in the adjustment period to be either smoothed out or lost. The simplifying assumptions, of course, are necessary to avoid a simulation analysis, and thus little can really be done about this defect. In spite of these defects, the approach is still capable of yielding reasonably satisfactory estimates for a project appraisal.

A hypothetical project will be used as an example to demonstrate how the approach can be applied. Although the example will deal only with the operating phase of a project, since this tends to be of prime concern, the approach is equally applicable to the construction phase. The hypothetical project will be assumed to create 500 direct and indirect jobs measured in man-years of employment, with 200 of these in place in the first year, 400 in the second year, and the full 500 in the third and subsequent years of the project. It will also be assumed that the project is expected to displace 10 percent of the jobs created and that the time path of displacement is identical to that of the created jobs. That is, 20 jobs are expected to be displaced in the first year, 40 in the second year, and the full 50 in the third and subsequent years.

An analysis of the region's labour market indicates that the current labour force is about 10 000 and that the region suffers from a persistent unemployment problem with an average labour force unemployment rate of about 10 percent over the last five to ten years. This "historically" determined unemployment rate is taken to represent the long-run rate that would prevail in the absence of the project. On the basis of the nature of the new project jobs, it is expected that there could be some reduction in the long-run employment rate since the new jobs are "year-round" and this should reduce some of the seasonality in the regional economy. However, the project jobs and the new induced non-basic jobs are also likely to be attractive to regional residents who otherwise would have left the region, to former regional residents employed and unemployed elsewhere, and to other non-residents. Therefore any

reduction in the region's long-run unemployment rate is expected to be small, with the reduction estimated at no more than 0.5 percent. This implies that 0.05 × 10 000, or 50 of the new jobs will ultimately be filled by local labour from the reduced unemployment rate. In the analysis, half of these local workers are assumed to fill new basic jobs and half new non-basic jobs. Finally, given the nature of the new jobs created, the project is expected to have little effect on the long-run participation rate so that all of the remaining new basic and non-basic jobs and any extra unemployment brought about by the increased labour force are expected to be filled by migrants and potential migrants.

The regional labour market analysis determined the labour supply required to ultimately support the increased regional activity in the new long-run equilibrium. However, if a simulation analysis is to be avoided, assumptions will have to be made about the labour supply required to support the change in regional activity in the adjustment period. The simplest approach is to assume that the short-run participation and unemployment rates in each year are equal to the long-run rates. Such an assumption implies that no additional local labour will be available to support the increased regional activity other than from the reduced unemployment rate and from activity that is displaced by the project. Since the short-run unemployment rate is assumed equal to the long-run rate, the short-run rate will fall from 10 percent to 9.5 percent in the first year and then remain constant over the life of the project. Hence, all of the jobs filled by local workers from the reduced unemployment rate will be filled during the first year. Moreover, the displaced local workers will fill new jobs, which for simplicity are assumed to be only basic sector jobs, in the year during which the workers are displaced. Any jobs not filled by local labour and any extra unemployment brought about by the growth in the labour force will have to be filled by migrant and potential migrant workers. Therefore the migration flows adjust instantaneously rather than with a lag.

The basic sector labour market changes in the adjustment period and in the new long-run equilibrium determine the composition of each year's multiplicand. The analyst must next determine the values of the multipliers to apply to each year's multiplicand in order to estimate the incremental non-basic activity. In the example, these estimates are made in two distinct parts which are then combined to produce the overall estimates for each year.

The Part One estimates involve the incremental non-basic activity associated with the reduced local unemployment, the displaced local jobs, and the new basic sector jobs. If these basic sector changes are measured in man-years of employment and unemployment, a set of employment and unemployment multipliers will be required to estimate the incremental non-basic employment. The basic sector changes, however, could also be measured in labour income by applying the appropriate annual labour incomes for employed, displaced, and unemployed workers. If this is done, a set of income multipliers will be required to estimate the incremental non-basic labour income.

The Part Two estimates involve the incremental non-basic activity associated with the extra unemployment brought about by the growth of the regional labour force. When migrant and potential migrant workers fill the new basic and non-basic

jobs in the Part One estimates, they cause the size of the labour force to be larger than it otherwise would. With a constant unemployment rate of 9.5 percent, the growth in the labour force will increase the number of unemployed workers, the flow of unemployment insurance benefits, and the number of non-basic jobs. Since the extra unemployed and non-basic workers will also be migrants and potential migrants, the process will be cumulative. The estimates of the incremental non-basic activity resulting from the extra unemployment are made by first estimating the extra unemployment measured in man-years and then applying a set of unemployment multipliers. The man-years of unemployment and employment can then be converted into the income flows by the appropriate average annual labour incomes for unemployed and non-basic workers.

The Part One estimates, therefore, require a set of labour income or employment and unemployment multipliers while the Part Two estimates require a set of unemployment multipliers. Appendix Table 9-1 provides such multipliers on the basis of estimates for Cape Breton County obtained earlier in sections 8.4.1 and 8.4.2. In each case, the multipliers show the first-round coefficient, and the subsequent-rounds multiplier based on the subsequent-rounds coefficient, since both are required to make the estimates.

The multipliers for migrants and potential migrants assume that the effects associated with this type of labour are spread over a three-year period as suggested in section 9.4.3. Hence, 60 percent of the effects are assumed to occur during the first year, 90 percent in the second, and the full 100 percent in the third and subsequent years of the project. The pure local multipliers assume that the effects are felt during the first year and then continue at that level over the life of the project.

The multipliers for employed, unemployed and displaced workers have been made consistent with the labour income multipliers in the manner suggested in section 8.4.2. Since the current labour incomes will not be the same as those used to derive the multipliers in section 8.4.2, data on the expected average annual labour income for basic employed, displaced and unemployed workers will have to be obtained.

In the example, such data have been assumed and the average annual labour income is set at $24 000 for basic employed workers, $15 000 for displaced workers, and $4 800 for unemployed workers. The annual labour income for a new basic employed worker is also assumed to be typical of the annual labour income earned by other regional basic sector workers.[1] This observation permits the estimation of the typical annual non-basic sector labour income for both income and population, and income-related non-basic employment. These estimates can be made on the basis of the ratio of average basic to non-basic labour income obtained when the labour income multipliers were estimated and they therefore assume that these ratios are

[1]This is done to simplify the example. However, if the suggested approach is used, the analyst will need an estimate of the current typical basic sector labour income for the region in order to obtain consistent employment and unemployment multipliers.

constant. Hence for income and population related non-basic employment, the average annual labour income is

$5 753/$5 928 × $24 000, or $23 291, and

for income-related non-basic employment it is

$5 369/$5 928 × $24 000, or $21 737.

Given the labour income estimates for the different types of labour, the employed, unemployed and displaced worker multipliers can readily be obtained in the manner shown in section 8.4.2.

Appendix Table 9-1
Income and Labour Force Multipliers
Used in the Example

Multiplier Type	Migrant and Potential Migrant Labour	Local Labour
Labour Income		
Year One	1 + 0.45 (1.83) = 1.83	1 + 0.29 (1.41) = 1.41
Year Two	1 + 0.55 (2.24) = 2.24	—
Year Three	1 + 0.58 (2.38) = 2.38	—
Employment		
Year One	1 + 0.46 (1.83) = 1.84	1 + 0.32 (1.41) = 1.45
Year Two	1 + 0.57 (2.24) = 2.28	—
Year Three	1 + 0.60 (2.38) = 2.43	—
Unemployment		
Year One	1 + 0.09 (1.83) = 1.16	1 + 0.06 (1.41) = 1.09
Year Two	1 + 0.11 (2.24) = 1.25	—
Year Three	1 + 0.12 (2.38) = 1.28	—
Displacement		
Year One	—	1 + 0.20 (1.41) = 1.28

Sufficient information now exists to make the estimates and they are shown on Worksheets One to Five. The first three worksheets show the Part One estimates, with one worksheet used for each year's multiplicand. The Part One estimates have been made in employment rather than income terms and the procedure used is set out in a series of steps with all of the multipliers drawn from Appendix Table 9-1. Worksheet Four provides the Part Two estimates, with the procedure again set out in a series of steps. The final worksheet, Worksheet Five, summarizes the estimates and converts them into income flows to produce a consistent set of income and labour force estimates for a project appraisal.

Worksheet One
Determining the Non-Basic Jobs Associated with Year One
Basic Sector Changes

Step	No.	Non-Basic Jobs in Year 1	2	3 and later
1. Determine Basic Sector Changes by Labour Type				
(a) Basic Sector Changes				
New basic jobs	+200			
Displaced jobs	− 20			
Reduced unemployment	− 50			
(b) By Labour Type				
(i) Local Labour				
Filling new jobs	+ 45			
In displaced jobs	− 20			
In reduced unemployment	− 50			
(ii) Migrant-Potential Migrant Labour				
Filling new jobs	+155			
2. Estimate First-Round Non-Basic Jobs[1]				
(a) Non-Basic Jobs Associated with				
(i) Local Labour in Basic Sector Changes				
Filling new jobs (0.32)	+ 45	+ 14.4		
In displaced jobs (0.20)	− 20	− 4.0		
In reduced unemployment (0.06)	− 50	− 3.0		
Total		+ 7.4	+ 7.4	+ 7.4

[1]Multipliers drawn from Table 9-1 are shown in brackets.

(Worksheet One continued on next page)

Worksheet One (continued)

Step	No.	Non-Basic Jobs in Year 1	2	3 and later
(ii) Migrant-Potential Migrant Labour in Basic Sector Changes				
Filling new jobs (0.46) (0.57) (0.60)	+155	71.3	88.4	93.0
Total		78.7	95.8	100.4
(b) Summary of First-Round Changes by Labour Type				
(i) Filled by Local Labour from Reduced Unemployment		25	25	25
(ii) Filled by Migrant-Potential Migrant Labour		53.7	70.8	75.4
3. *Estimate Subsequent-Rounds Changes*[1]				
(a) Non-Basic Jobs Related to				
(i) Local Labour Filling First-Round Jobs[2] 25[(0.29) + (0.29) (0.83)], 25[(0.29) + (0.29) (1.24)], 25[(0.29) + 0.29) (1.38)]		7.3 + 6.0	7.3 + 8.9	7.3 + 10.0
(ii) Migrant-Potential Migrant Labour Filling First-Round Jobs, 53.7 (0.83), 70.8 (1.24), 75.4 (1.38)		44.6	87.8	104.1
Total		57.9	104.0	121.4

[1]Multipliers drawn from Table 9-1 are shown in brackets.

[2]The subsequent-rounds changes for local labour are based on the second-round income-related non-basic jobs induced by local labour (captured by the coefficient 0.29) and the later-rounds income and population-related non-basic jobs induced by the migrant-potential migrant labour filling the second-round non-basic jobs (captured by 0.29 times the lagged migrant-potential migrant multipliers).

(Worksheet One concluded on next page)

Worksheet One (concluded)

Step	No.	Non-Basic Jobs in Year 1	2	3 and later
4. Summarize Non-Basic Jobs Created				
(a) By Round				
(i) First Round		78.7	95.8	100.4
(ii) Subsequent Rounds		57.9	104.0	121.4
Total		136.6	199.8	221.8
(b) By Type of Job Created (to Worksheet Five)				
(i) Income-Related (Associated with Local Labour)[1]	7.4 + 7.3	14.7	14.7	14.7
(ii) Income and Population-Related (Associated with Migrant-Potential Migrant Labour)		121.9	185.1	207.1
Total		136.6	199.8	221.8
(c) By Type of Labour Filling Jobs				
(i) Local Labour from Reduced Unemployment		25.0	25.0	25.0
(ii) Migrant-Potential Migrant Labour		111.6	174.8	196.8
Total		136.6	199.8	221.8
5. Summarize Labour Force Change (to Worksheet Four)				
(a) Migrant-Potential Migrant Labour				
(i) Filling Basic Jobs		155.0	155.0	155.0
(ii) Filling Non-Basic Jobs		111.6	174.8	196.8
Total		266.6	329.8	351.8

[1]From 2(a)(i), 7.4 and 3(a)(i), 7.3.

Worksheet Two
Determining the Non-Basic Jobs Associated with Year Two
Basic Sector Changes

Step	No.	Non-Basic Jobs in Year 2	3	4 and later
1. Determine Basic Sector Changes by Labour Type				
(a) Basic Sector Changes				
New basic jobs	+200			
Displaced jobs	− 20			
Reduced unemployment	—			
(b) By Labour Type				
(i) Local Labour				
Filling new jobs	+ 20			
In displaced jobs	− 20			
In reduced unemployment	—			
(ii) Migrant-Potential Migrant Labour				
Filling new jobs	+180			
2. Estimate First-Round Non-Basic Jobs[1]				
(a) Non-Basic Jobs Associated with				
(i) Local Labour in Basic Sector Changes				
Filling new jobs (0.32)	+ 20	+ 6.4		
In displaced jobs (0.20)	− 20	− 4.0		
In reduced unemployment (0.06)	—	—		
Total		+ 2.4	+ 2.4	+ 2.4

[1]Multipliers drawn from Table 9-1 are shown in brackets.

(Worksheet Two continued on next page)

Worksheet Two (continued)

Step	No.	Non-Basic Jobs in Year 2	3	4 and later
(ii) Migrant-Potential Migrant Labour in Basic Sector Changes				
Filling new jobs (0.46), (0.57), (0.60)	+180	+ 82.8	+102.6	+108.0
Total		+ 85.2	+105.0	+110.4
(b) Summary of First-Round Changes by Labour Type				
(i) Filled by Local Labour from Reduced Unemployment		—	—	—
(ii) Filled by Migrant-Potential Migrant Labour		+ 85.2	+105.0	+110.4
3. *Estimate Subsequent-Rounds Changes*[1]				
(a) Non-Basic Jobs Related to				
(i) Local Labour Filling First-Round Jobs [(0.29) + (0.29) (0.83)] [(0.29) + (0.29) (1.24)] [(0.29) + 0.29) (1.38)]		—	—	--
(ii) Migrant-Potential Migrant Labour Filling First-Round Jobs, 85.2 (0.83) 105.0 (1.24), 110.4 (1.38)		+ 70.7	+130.2	+152.3
Total		+ 70.7	+130.2	+152.3

[1]Multipliers drawn from Table 9-1 are shown in brackets.

(Worksheet Two concluded on next page)

Worksheet Two (concluded)

Step	No.	Non-Basic Jobs in Year 2	3	4 and later
4. Summarize Non-Basic Jobs Created				
(a) By Round				
(i) First Round		+ 85.2	+105.0	+110.4
(ii) Subsequent Rounds		+ 70.7	+130.2	+152.3
Total		+155.9	+235.2	+262.7
(b) By Type of Job Created (to Worksheet Five)				
(i) Income-Related (Associated with Local Labour)		+ 2.4	+ 2.4	+ 2.4
(ii) Income and Population-Related (Associated with Migrant-Potential Migrant Labour)		+153.5	+232.8	+260.3
Total		+155.9	+235.2	+262.7
(c) By Type of Labour Filling Jobs				
(i) Local Labour from Reduced Unemployment		—	—	—
(ii) Migrant-Potential Migrant Labour		+155.9	+235.2	+262.7
Total		+155.9	+235.2	+262.7
5. Summarize Labour Force Change (to Worksheet Four)				
(a) Migrant-Potential Migrant Labour				
(i) Filling Basic Jobs		+180.0	+180.0	+180.0
(ii) Filling Non-Basic Jobs		+155.9	+235.2	+262.7
Total		+335.9	+415.2	+442.7

Worksheet Three

Determining the Non-Basic Jobs Associated with Year Three
Basic Sector Changes

Step	No.	Non-Basic Jobs in Year 3	4	5 and later
1. *Determine Basic Sector Changes by Labour Type*				
(a) Basic Sector Changes				
New basic jobs	+100			
Displaced jobs	− 10			
Reduced unemployment	—			
(b) By Labour Type				
(i) Local Labour				
Filling new jobs	+ 10			
In displaced jobs	− 10			
In reduced unemployment	—			
(ii) Migrant-Potential Migrant Labour				
Filling new jobs	+ 90			
2. *Estimate First-Round Non-Basic Jobs*[1]				
(a) Non-Basic Jobs Associated with				
(i) Local Labour in Basic Sector Changes				
Filling new jobs (0.32)	+ 10	+ 3.2		
In displaced jobs (0.20)	− 10	− 2.0		
In reduced unemployment (0.06)	—	—		
Total		+ 1.2	+ 1.2	+ 1.2

[1]Multipliers drawn from Table 9-1 are shown in brackets.

(Worksheet Three continued on next page)

Worksheet Three (continued)

Step	No.	Non-Basic Jobs in Year 3	4	5 and later
(ii) Migrant-Potential Migrant Labour in Basic Sector Changes				
Filling new jobs (0.46) (0.57) (0.60)	+ 90	+ 41.4	+ 51.3	+ 54.0
Total		+ 42.6	+ 52.5	+ 55.2
(b) Summary of First-Round Changes by Labour Type				
(i) Filled by Local Labour from Reduced Unemployment		—	—	—
(ii) Filled by Migrant-Potential Migrant Labour		+ 42.6	+ 52.5	+ 55.2
3. *Estimate Subsequent-Rounds Changes*[1]				
(a) Non-Basic Jobs Related to				
(i) Local Labour Filling First-Round Jobs [(0.29) + (0.29) (0.83)], [(0.29) + (0.29) (1.24)] [(0.29) + 0.29) (1.38)]		—	—	—
(ii) Migrant-Potential Migrant Labour Filling First-Round Jobs, 42.6 (0.83), 52.5 (1.24), 55.2 (1.38)		+ 35.4	+ 65.1	+ 76.1
Total		+ 35.4	+ 65.1	+ 76.1

[1]Multipliers drawn from Table 9-1 are shown in brackets.

(Worksheet Three concluded on next page)

Worksheet Three (concluded)

Step	No.	Non-Basic Jobs in Year 3	4	5 and later
4. Summarize Non-Basic Jobs Created				
(a) By Round				
(i) First Round		+ 42.6	+ 52.5	+ 55.2
(ii) Subsequent Rounds		+ 35.4	+ 65.1	+ 76.1
Total		+ 78.0	+117.6	+131.3
(b) By Type of Job Created (to Worksheet Five)				
(i) Income-Related (Associated with Local Labour)		+ 1.2	+ 1.2	+ 1.2
(ii) Income and Population-Related (Associated with Migrant-Potential Migrant Labour)		+ 76.8	+116.4	+130.1
Total		+ 78.0	+117.6	+131.3
(c) By Type of Labour Filling Jobs				
(i) Local Labour from Reduced Unemployment		—	—	—
(ii) Migrant-Potential Migrant Labour		+ 78.0	+117.6	+131.3
Total		+ 78.0	+117.6	+131.3
5. Summarize Labour Force Change (to Worksheet Four)				
(a) Migrant-Potential Migrant Labour				
(i) Filling Basic Jobs		+ 90.0	+ 90.0	+ 90.0
(ii) Filling Non-Basic Jobs		+ 78.0	+117.6	+131.3
Total		+168.0	+207.6	+221.3

Worksheet Four

Determining Migrant-Potential Migrant Unemployment, and Non-Basic Employment Related to Migrant-Potential Migrant Unemployment

Step	Unemployment and Non-Basic Employment in Year					
	1	2	3	4	5	6 and later
1. Determine Migrant-Potential Migrant Employment in Each Year						
(a) Migrant-Potential Migrant Basic and Non-Basic Employment (from Step 5 on Worksheets One to Three)	+266.6	+665.7	+ 935.0	+1 002.1	+1 015.8	+1 015.8
(b) Migrant-Potential Migrant Non-Basic Employment Induced by Previous Year's Unemployment (from Step 4 below)	—	+ 7.1	+ 18.7	+ 27.3	+ 30.1	+ 30.7
(c) Sub-total	+266.6	+672.8	+ 953.7	+1 029.4	+1 045.9	+1 046.5
(d) Migrant-Potential Migrant Unemployment Induced by Current Year's Unemployment (from Step 4 below)	+ 4.6	+ 6.9	+ 4.7	+ 1.2	+ 0.3	—
(e) Total	+271.2	+679.7	+ 958.4	+1 030.6	+1 046.2	+1 046.5
2. Determine Change in Migrant-Potential Migrant Employment (ΔEm) from Previous Year						
(a) Change for Current Year (Step 1c) Less Previous Year (Step 1e)	+266.6	+401.6	+ 274.0	+ 71.0	+ 15.3	+ 0.3
3. Estimate Migrant-Potential Migrant Unemployment (Um) *by Year*						
(a) Migrant-Potential Migrant Unemployment Associated with Each Year's Migrant-Potential Migrant Employment[1] Um = 0.095 (ΔEm + 1.16 Um)						
For Year 1	+ 28.5	+ 28.5	+ 28.5	+ 28.5	+ 28.5	+ 28.5
For Year 2		+ 42.9	+ 42.9	+ 42.9	+ 42.9	+ 42.9
For Year 3			+ 29.3	+ 29.3	+ 29.3	+ 29.3
For Year 4				+ 7.6	+ 7.6	+ 7.6
For Year 5					+ 1.6	+ 1.6
For Year 6						—
Total (to Worksheet Five)	+ 28.5	+ 71.4	+ 100.7	+ 108.3	+ 109.9	+ 109.9

1. Um = 0.095 (ΔEm + Num + Um).
Num = 0.16 Um,
where Num is the non-basic employment induced by the current year's migrant-potential migrant unemployment shown in Step 1(d) and determined in Step 4.

Worksheet Four (concluded)

Step	Unemployment and Non-Basic Employment in Year					
	1	2	3	4	5	6 and later
4. Estimate Non-Basic Employment Induced by Migrant-Potential Migrant Unemployment (Num)						
(a) Non-Basic Employment Associated with Each Year's Unemployment, 0.16 Um, 0.25 Um, 0.28 Um						
For Year 1	+ 4.6	+ 7.1	+ 8.0	+ 8.0	+ 8.0	+ 8.0
For Year 2		+ 6.9	+ 10.7	+ 12.0	+ 12.0	+ 12.0
For Year 3			+ 4.7	+ 7.3	+ 8.2	+ 8.2
For Year 4				+ 1.2	+ 1.9	+ 2.1
For Year 5					+ 0.3	+ 0.4
For Year 6						—
Total (to Worksheet Five)	+ 4.6	+ 14.0	+ 23.4	+ 28.5	+ 30.4	+ 30.7
5. Summarize						
(a) Migrant-Potential Migrant Unemployment (from Step 3)	+ 28.5	+ 71.4	+ 100.7	+ 108.3	+ 109.9	+ 109.9
(b) Migrant-Potential Migrant Employment (from Step 1c)	+271.2	+679.7	+ 958.4	+1 030.6	+1 046.2	+1 046.5
Total Labour Force Change	+299.7	+751.1	+1 059.1	+1 138.9	+1 156.1	+1 156.4
(c) Unemployment Rate (%)	9.5	9.5	9.5	9.5	9.5	9.5

Worksheet Five

Summary of Labour Force Changes (in man-years) and
Regional Income Changes (in thousands of dollars)

	Year 1		Year 2		Year 3		Year 4		Year 5	
Sector	Labour Force	Income	Labour Force	Income	Labour Force	Income	Labour Force	Income	Labour Force	Income
Basic Sector										
New Jobs ($24 000)	+200.0	+4 600	+400.0	+ 9 600	+ 500.0	+12 000	+ 500.0	+12 000	+ 500.0	+12 000
Displaced Jobs ($15 000)	− 20.0	− 300	− 40.0	− 600	− 50.0	− 750	− 50.0	− 750	− 50.0	− 750
Unemployment ($4 800)										
Decrease	− 50.0	− 240	− 50.0	− 240	− 50.0	− 240	− 50.0	− 240	− 50.0	− 240
Increase	+ 28.5	+ 137	+ 71.4	+ 343	+ 100.7	+ 483	+ 108.3	+ 520	+ 109.9	+ 528
Net Change	− 21.5	− 103	+ 21.4	+ 103	+ 50.7	+ 243	+ 58.3	+ 280	+ 59.9	+ 288
Basic Sector Changes	+158.5	+4 397	+381.4	+ 9 103	+ 500.7	+11 493	+ 508.3	+11 530	+ 509.9	+11 538
Non-Basic Sector										
Income-Related Jobs ($21 737)	+ 14.7	+ 320	+ 17.1	+ 372	+ 18.3	+ 398	+ 18.3	+ 398	+ 18.3	+ 398
Income and Population-Related Jobs ($23 291)	+126.5	+2 946	+352.6	+ 8 212	+ 540.1	+12 579	+ 612.3	+14 261	+ 627.9	+14 624
Non-Basic Sector Changes	+141.2	+3 266	+369.7	+ 8 584	+ 558.4	+12 977	+ 630.6	+14 659	+ 646.2	+15 022
Total	+299.7	+7 663	+751.1	+17 687	+1 059.4	+24 470	+1 138.9	+26 189	+1 156.2	+26 560
Income Multiplier		1.74		1.94		2.13		2.27		2.30

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